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Note.—Initialed reviews are written by the following:—

Mr J. P. R. Riches .. .. J. P. R. R.

* General studies, see also individual crops.

Plant Breeding Abstracts

Vol. XXI, No. 3

1454.

(A conference of botanists and plant breeders).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 6 : 60–61. [Russian].

On 24 to 27 March 1950 a conference of Soviet botanists and plant breeders was held in Leningrad. The aim of the participants was to coordinate their work so as to make fuller use of the natural plant resources of the USSR for the purpose of Mičurinite breeding. Most of the reports dealt with wild forage plants and wild fruit trees, including monographs on the following wild plants which are regarded as promising from the plant breeder's viewpoint: *Trigonella*, clover, sainfoin, *Agropyron*, apple, pear, almond and walnut.

*STATISTICS

1455. PAULL, A. E.

On a preliminary test for pooling mean squares in the analysis of variance.
Ann. Math. Statist. 1950 : **21** : 539–56.

It has become common for research workers dealing with an analysis of variance table to pool certain mean squares before carrying out the tests; thus high order interactions may be pooled in order to increase the degrees of freedom for error. The present paper deals with a simple case of this method. Let s_1, s_2, s_3 be three independent sums of squares estimating $n_1\sigma_1^2$, $n_2\sigma_2^2$, $n_3\sigma_3^2$ respectively. Then three tests are discussed to test the ratio σ_3^2/σ_2^2. Firstly, the never-pool, which uses the ratio s_3/s_2. Secondly, the always-pool, which uses the ratio $s_3/(s_1 + s_2)$. Thirdly, the sometimes-pool, in which the ratio s_2/s_1 is first tested; if this is significant then s_3/s_2 is used for the final test, otherwise $s_3/(s_1 + s_2)$ is used. The merits of these tests are discussed and recommendations made. It should be noted that the argument applies to the situation where each of the factors is itself a sample from some population and it is desired to make inferences about this population, and not to the case where the factors are fixed and deductions apply to those factors alone.

1456. COCHRAN, W. G.

The comparison of percentages in matched samples.
Biometrika 1950 : **37** : 256–66.

In this paper the familiar χ^2 test for comparing the percentages of successes in a number of independent samples is extended to the situation in which each member of any sample is matched in some way with a member of every other sample. The data are arranged in a two-way table with r rows and c columns, in which each column represents a sample and each row a matched group. The entries in the table are the number of successes. The test criterion proposed is

$$Q = \frac{c(c-1)\,\Sigma\,(T_j - \bar{T})^2}{c(\Sigma\,u_i) - (\Sigma\,u_i^2)},$$

where T_j is the total number of successes in the j^{th} sample (column) and u_i the total number in the i^{th} row. If the true probability of success is the same in all samples, the limiting distribution of Q, when the number of rows is large, is the χ^2-distribution with $(c - 1)$ degrees of freedom. The relation between this test and the ordinary χ^2 test, valid when the samples are independent, is discussed. The small sample properties of the new test are examined and it appears that the χ^2 approximation to the distribution of Q is adequate when $c = 3$, 4 or 5. Other approximations are also investigated.

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* General studies, see also individual crops.

1457. HARTLEY, H. O.
The use of range in analysis of variance.
Biometrika 1950 : **37** : 271–80.

The author suggests that the range might be used in those situations in which the analysis of variance technique would usually be employed. This may result in a loss of efficiency but a reduction in the labour of computation, and may therefore be expected to be of value in cases where the data are easily obtained. The randomized block experiment is discussed in detail and the necessary tables for carrying out the significance tests are provided. It is pointed out that this procedure provides for a current control of the homogeneity of variance without adding to the labour of the main analysis.
It is remarked that "most of the more complex orthogonal designs can be analysed by a similar procedure. . . . The analysis of the split-plot design is particularly convenient. Before proceeding with these details, however, it seems desirable first to check the accuracy of the approximations involved in more detail."

1458. HARTLEY, H. O.
The maximum F-ratio as a short-cut test for heterogeneity of variance.
Biometrika 1950 : **37** : 308–12.

The usual test for the heterogeneity of a set of variances is Bartlett's modification of Neyman-Pearson's L_1 test. The present author proposes the criterion, the ratio of the maximum to the minimum variances. A table of approximate upper 5% points in a set of k mean squares all based on ν degrees of freedom is given for $k = 2\ (1)\ 12$, $\nu = 2\ (1)\ 10, 12, 15, 20, 30, 60, \infty$. There is a discussion of the power of the test in relation to Bartlett's.

1459. EHRENBERG, A. S. C.
Unbiased estimation of heterogeneous error variances.
Biometrika 1950 : **37** : 347–57.

The situation considered is two-way or higher classification without replication where the error variances may differ between the classes of one classification. For example in treatments applied to several varieties, the varieties may differ in their error variances. Standard methods of estimating these errors fail and the author suggests other simple methods, and investigates their variances. The analysis of variance of the data is discussed.

1460. ANSCOMBE, F. J.
Sampling theory of the negative binomial and logarithmic series distribution.
Biometrika 1950 : **37** : 358–82.

This detailed study of the subject comprises the following: a comparison of the negative binomial distribution with seven other distributions that have been proposed; the estimation of the parameters of a negative binomial in large samples; large sample tests for discriminating between alternative forms of parent distribution; estimation of a common exponent in a series of samples, when the populations differ in their means; the estimation of the parameter of a logarithmic series; and two tests of departure from a logarithmic series.

1461. TAYLOR, J.
The comparison of pairs of treatments in split-plot experiments.
Biometrika 1950 : **37** : 443–44.

Consider an experiment in J randomized blocks with K primary treatments. Suppose further that each of the JK plots is divided into L subplots upon which L secondary

treatments are disposed at random. The author shows how to test the significance of differences between combinations of primary and secondary treatments with different primary treatments.

1462. BANERJEE, K. S.
A note on the fractional replication of factorial experiments.
Sankhyā: Indian J. Statist. 1950 : **10** : 87–94.

A detailed discussion of a three-fourth replicate of a 2^n experiment is given.

1463. RADHAKRISHNA RAO, C.
The theory of fractional replications in factorial experiments.
Sankhyā: Indian J. Statist. 1950 : **10** : 81–86.

When the number of factors in an experiment is large an experiment involving all combinations would be unwieldy. If, however, some higher order interactions are absent the lower order interactions and main effects can be investigated by using a subset of the treatment combinations. The author uses devices introduced by him (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 603) to develop a method of construction of such designs when all the factors are at the same number, s, of levels and s is a prime or a prime power.

*GENETICS

1464. SHIMOTOMAI, N.
(Miscellaneous observations on European and American biology. I.).
Bot. and Zool. 1939 : **7** : 933–36. [Japanese].

A brief account is given of the pioneer genetical work initiated under the auspices of Morgan, Sturtevant and Bridges.

1465. FIEDLER, J.
Význam křížení pro šlechtění rostlin. **(The importance of hybridization in plant breeding work).**
Sborn. Českosl. Akad. Zeměd. 1950 : **22** : 559–63.

Breeding experiments with various economic plants, including wheat and beet, suggest the importance of the following methods: suitable selection of components for the crosses; the use of pollen of more than one individual, the use of pollen of individuals grown in different environments from that of the female parent and the use of pollen mixtures. These methods have the effect of shattering the inheritance and increasing the range of variability and the yielding capacity of the plants. Double crosses of variable F_1 material further extend the variability. In inbreeding great importance is attached to the use of tried plant material, and, in vegetative hybridization, to intergeneric grafts.

1466. BALLATORE, G. P.
La "nuova genetica" russa. **(The "new genetics" of Russia).**
Ital. Agric. 1950 : **87** : 715–18.

The present position of the study of inheritance in the USSR is critically examined.

1467. BELAŠ, T. I.
(To a more creative scientific biology. The question of a syllabus for a course on Darwinism raised in the form of a discussion).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 6 : 62–71. [Russian].

The officially sanctioned syllabus on teaching Darwinism in the USSR prepared by I. I. Prezent (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 1527) in 1948, two months after

* General studies, see also individual crops.

the Mičurinite session of the Lenin Academy of Agricultural Sciences (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 2000), is regarded as outmoded.
In an editorial footnote to the paper a reference is made to a revised syllabus, published in the same number of *Selekcija i Semenovodstvo* (*Breeding and Seed Growing*) and a discussion of the new syllabus is invited (cf. Abst. 1470).

1468. Muller, H. J.
Science in bondage.
Science 1951 : **113** : 25–29.

This article is based on an address delivered at the Congress of Cultural Freedom held in Berlin, June 1950. The social and cultural implications of science in general are discussed; recent developments in Soviet science, particularly the rise of the Lysenko school, are criticized.

1469. Oljšanskiĭ, M. A.
(The creative role of selection in the light of Mičurin's teaching).
Agrobiologija (Agrobiology) 1950 : No. 4 : 21–37. [Russian].

The theoretical and practical differences between the classical Darwinist and Mičurinite concepts of evolution are discussed, with a reference to the effect of the divergent theories upon practical selection. Recent results of Mičurinite breeding work are mentioned. These include the breeding of new varieties of cereals and cottons at Odessa, a winter wheat obtained by vegetative hybridization at Jaroslavlj, potatoes with a high starch content produced vegetatively at the Institute for Potato Farming and early vegetative hybrids of tomatoes with fruits resistant to cracking developed at Odessa.
At Odessa, a method for training F_1 hybrids was developed which gives uniform offspring in the F_2. It is thought that the degeneration frequently observed in *Populus pyramidalis* is due to vegetative reproduction for a long period and that it can be overcome by sexual reproduction.

1470. Prezent, I. I.
(Letter to the editor and a projected syllabus).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 6 : p. 72. [Russian].

The nature of changes in the original syllabus of the course on Darwinism (cf. Abst. 1467) is indicated. The sections affected by the revision include those on speciation and adaptation.

1471. Prezent, I. I.
(The syllabus of the course on "Darwinism").
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 6 : 72–79. [Russian].

The new comprehensive course on Darwinism involves 54 lectures and 54 seminars. It has an introduction and is divided into four major sections: the metaphysical period in the history of biology, Darwin's teaching on organic evolution, the development of Darwinism by Russian scientists, and creative (Mičurinite) Darwinism.

1472. Richens, R. H.
The essentials of the new Soviet genetics.
Agric. Progr. 1950 : **25** : 25–35.

A general outline is given of the characteristic principles of the new Soviet genetics.

1473. SINGLETON, W. R.
Golden Jubilee celebration of the Genetics Society of America.
Science 1950 : **112** : 795–96.

An account is given of the nineteenth annual general meeting of the Genetics Society of America at which the rediscovery of Mendel's laws of inheritance in 1900 was celebrated. Papers were presented on the historical and developmental aspects of genetics; the physical basis of the gene; the physiology of the gene; cytogenetics; genetics, medicine and man; genetics and the food problem; and genetics and modern thought.

1474. HORNER, T. W.,
COMSTOCK, R. E. and
ROBINSON, H. F.
The contribution of non-allelic gene interactions to variance in populations of selfed lines.
Genetics 1950 : **35** : p. 671. (Abst.).

It is pointed out that estimates of additive genetic variance and variance due to dominance deviations have usually been made without taking account of variance resulting from the interaction of non-allelic genes. If such interactions are present, they could cause considerable bias in estimates made with data obtained from a population originating by self fertilization. An analysis has therefore been made of the expected genetic variance between and within successive generations of selfed organisms in terms of the additive, dominance and interaction components. Relevant formulae have been devised. Their application to several familiar types of gene interactions shows that in some cases rather large biases may result if interaction variance is ignored.

1475. *BOONSTRA, A. E. H. R.
Een physiologische beschouwing van de theorie van Lysenko. (**A physiological survey of Lysenko's theory**).
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) 27 October, 1949 Wageningen : 297–305. (Mimeographed).

Warning geneticists not to reject too hastily Lysenko's remarkable theory that a plant can be forced to assimilate foreign substances and that its offspring then require such substances for their development, the speaker cited numerous instances of apparent effects of environment in inducing variation in the plant and animal kingdoms.
The examples cited appear more pertinent than Lysenko's own, which are of little or no value as evidence, and the controversy may in the speaker's opinion lead to a profitable reconsideration of the concept "heredity."

1476.
Carnegie Institution of Washington.
Year Book No. 49 : 1949–1950 : Pp. 220.

Bush, V. *Report of the president.* (*pp. 3–14*).

Various aspects of the progress of investigations, including cytological and genetical research, carried out at the Carnegie Institution, are reviewed.

French, C. S. *Division of Plant Biology.* (*pp. 83–85*).

The work of the division, during the year, is reviewed.

Davis, E. A. Chlorella *mutants as a tool for studying photosynthesis.* (*pp. 95–98*).

By exposing *Chlorella* to ultraviolet radiation for sufficient time to kill most of the cells three surviving mutants have been obtained; these are no longer capable of performing all

* An extended summary is on file at the Bureau.

the physiological functions of the parent, and are abnormal with respect to photosynthesis, although they contain chlorophyll. None of the mutants absorbs carbon dioxide. Each appears to be blocked at a different step of the photosynthetic mechanism. Only strain 332 liberates oxygen in the light; presumably it is capable of transferring the remaining hydrogen to something other than the normal carbon dioxide acceptor.
Variations in the ability of the mutants to form or accumulate chlorophyll at different light intensities were also observed. Mutant strain 349 forms more chlorophyll in the dark and in weak light than in strong light; strain 322 forms the maximum amount of chlorophyll at high light intensities; an intermediate course, somewhat similar to that of normal cells, is taken by strain 332.

Clausen, J., Keck, D. D., Hiesey, W. M. and Grun, P. — *Experimental taxonomy.* (*pp. 101–14*).

The objective of the experimental taxonomy programme is a study of the principles that govern the causes and forces active in the evolution of plants.
Individuals representing contrasting climatic species, races and hybrids of *Poa*, *Achillea* and *Mimulus* were grown at nine different temperatures, other environmental factors being constant, and the observations on comparative growth were integrated with those on cytology; hidden potentialities and limitations of the races, hitherto unsuspected, have been demonstrated; differences in response generally appear to be related to the success of the race in its native climate.
The influence of environment on chromosome pairing in *Poa* (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2166) was investigated. Using the number of unpaired chromosomes at the first meiotic interphase as a measure of pairing irregularity, analyses showed a remarkable constancy of pairing behaviour in most of the plants under variable weather conditions at any one station and at different stations. It appears that pairing is a genetically controlled process which remains uninfluenced by environment apart from drastic treatments.
Counts of chromosome numbers of *Poa* species and interspecific hybrids resulted in the establishment of two distinct classes: (1) those plants in which the chromosome number approximates to half the number of chromosomes of the female parent added to half of those of the male, and (2) plants in which all the chromosomes of the female parent are combined with half of those of the male.
An attempt is being made by O. Norvell to classify the major subcategories of the genus *Phaseolus*, using material from the southwestern states and Mexico. Crosses between perennial wild forms of *Ph. vulgaris* and the cultivated annual beans of the bush type showed complete fertility, indicating that they are conspecific; the F_1 consisted of climbing perennials and the F_2 showed a simple segregation of these factors suggesting that the cultivated type may have arisen directly through a series of recessive mutations.

Demerec, M. — *Department of Genetics.* (*pp. 139–43*).

A survey is presented of the work of the department. The focus of interest continues to be the nature of genes and chromosomes.

Demerec, M. et al. — *The gene.* (*pp. 144–57*).

Studies of changes between streptomycin sensitivity and streptomycin dependence have been continued with *Escherichia coli*; additional support has been obtained for the conclusions already reached (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2166). A more detailed analysis of the properties of mutants has shown that streptomycin-dependent mutants are invariably partially deficient for some factor involved in growth. Among 165 dependent mutants 2 completely growth-deficient types were found, one deficient for methionine and the other for cystine. All back mutants derived from dependent mutants remain partially deficient. The same is true of resistance to ultraviolet radiation; further streptomycin mutants derived from a streptomycin-resistant, radiation-sensitive mutant remain sensitive to radiation; the mutation rate of a streptomycin-resistant mutant is not predetermined

by the rate of its progenitor. Using the K–12 strain of *E. coli*, 11 resistant and 22 dependent mutants were tested for recombination; none was observed, a result supporting the assumption that various mutations occur either in a single gene locus or in adjacent loci. An extensive survey of chemicals has been undertaken to determine their mutagenic capacities. Several ferrous and manganous compounds are much more potent in inducing certain hereditary changes than any other chemicals. Their effectiveness in inducing reversions in *E. coli* B/r/Sd-$_4$ depends on the physiological condition, particularly the permeability, of the cells being treated; substances such as sodium chloride, calcium chloride or sucrose, applied before treatment, increase the cell permeability and subsequently the mutagenic effect of the chemicals. Further studies of the mutagenic action of ferrous sulphate on a streptomycin-dependent strain of *E. coli* showed that the frequency of reversion to streptomycin non-dependence could be increased by a temperature shock produced by exposure to ferrous sulphate at 1° C. followed by dilution in water at 37° C.
The results of preliminary studies of the genetic role of the nucleus in *E. coli* indicate that in multinucleate cells the bodies considered to be nuclei, on the basis of cytochemical characteristics, are actually nuclei in the sense that they carry genetic determinants and that nuclear segregation is partially responsible for delayed mutations.
The occurrence of a suppressor mutation in *E. coli* has been demonstrated; an apparent reversion to the wild type phenotype occurs as a result of mutation at an independent locus rather than a true back mutation.

McClintock, B. *Mutable loci in maize.* (*pp. 157–67*).

An interpretation of the origin and behaviour of mutable loci in maize has been put forward. The basic concept of this interpretation requires the transposition of minute pieces of chromosome from one position to another. When the chromatin is inserted adjacent to an active gene the normal action of the latter is inhibited; total or partial release from inhibition occurs by removal or alteration in the organization of the foreign chromatin because the foreign chromatin becomes adhesive in certain somatic cells and this causes a rupturing of the chromosome at the adhered locus during the subsequent mitotic cycle.
The *Ds* and *Ac* loci, previously described (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2166), are composed of a type of chromatin which can undergo such transpositions; further investigation of a number of transpositions of *Ds* and *Ac*, arising independently, is directed towards revealing the mechanism by which these occur, and the positions on the chromosomes at which *Ds* and *Ac* may be inserted have been determined. Preliminary evidence of the nature of the chromatin involved indicates that the heterochromatic regions of the chromosomes are primarily responsible; whether these observed phenomena are reflections of normal rather than aberrant chromosome behaviour is still a matter of conjecture but it is hoped that continued observations will ascertain some aspects of the normal mode of gene action.

Kaufmann, B. P. et al. *Organization of the chromosome.* (*pp. 168–77*).

Cytochemical methods, using purified enzymes in combination with staining procedures (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2166), have been used during the past year to continue the analysis of the chemical constitution of the chromosome. It has been possible to demonstrate in fixed cells the association of ribonucleic acid with a histone protein and of desoxyribonucleic acid with a more acidic protein, rich in tryptophane. Previous observations have revealed the association of desoxyribonucleic acid with histone and ribonucleic acid with a tryptophane protein; both sets of results emphasize the intricate patterns of combination which exist between cellular nucleoproteins.
Investigations of digestion with trypsin are described; they indicate that nucleic acids are actively concerned in the process of disintegration of cells, an assumption which contrasts with the classical interpretation that the nucleic acids are lost from the cell by the action of trypsin in dissociating peptide linkages which serve to maintain the continuity of protein substrates.
The swelling of cells, caused by successive treatments with an aqueous solution of trypsin, a potassium phosphate buffer and water, facilitates the study of fixed material.

1477. NAKAYAMA, K.
(Recent investigations on the genetics of development in plants).
Bot. and Zool. 1939 : 7 : 1439–47. [Japanese].

A review is presented of recent work on quantitative inheritance, heterosis and reciprocal differences in type of growth following hybridization.

1478. YASUI, K.
Cytogenetic studies in *Melandrium album*. I. An ovary formation gene located in an autosome, with special reference to its linkage relation.
Cytologia, Tokyo 1942 : **12** : 347–55.

Among the offspring of a modified male plant, which arose spontaneously, were found a number of females with abnormal ovaries and plants with entire petals. Progeny of these plants were used to investigate the factors controlling ovary formation. Assuming that the gene controlling abnormal ovary formation is *i* and its dominant allele is *I*, and that the gene concerned with the development of an entire petal is *e*, with its dominant allele as *E*, the observed ratio of the F_1 from the cross *Iiee* x *IiEe* indicates the occurrence of linkage between the *Ii* and *Ee* genes, with a recombination value of 25%.
The presence of a gene controlling removal of the inhibition on ovary formation in the modified male plant is suggested; the possibility of its linkage with the *Ii* and *Ee* alleles is considered.

1479. SAYAR, H. Z.
Multigenes and multigenic inheritance in the carpel number character of *Gossypium herbaceum*.
Ithaca 1950 : Pp. 188. (Mimeographed).

The results of an intensive analysis of the genetics of carpel number in *G. herbaceum*, carried out at the Cotton Breeding and Experiment Station, Adena, Turkey, during the period 1941 to 1949, are presented in considerable detail. On the basis of these results the author presents the hypothesis of multigenic inheritance for this character and for quantitative variation in general. The term monogene or intrachromosomal gene is applied to single genes arranged linearly in the chromosomes. The term multigene or extrachromosomal gene is used for another class of genes, organized in groups outside the linear file, each group being called a set. In *G. herbaceum* the carpel number depends upon four multigenic sets in two pairs, each set comprising 16 genes. The number of genes in each of such sets is regarded as constant. It is suggested that multigenes are held together by some form of bond or attachment, that each set is connected with the linear file through one of its members, which behaves as a monogene, and thus each set has a particular position on the chromosome. The distinction between monogenes and multigenes is purely one of organization.
In the case of the genes conditioning carpel number, the data are interpreted as providing evidence that allelomorphic sets of multigenes conjugate and exchange genes during mitosis and meiosis. Such exchanges are not limited to one or two genes but may involve all the multigenes concerned. It is thought that such exchanges are usually non-random processes in this case. Thus the Mendelian law of segregation for monogenes is not applicable to multigenes. In multigenic segregation in general, the strict limitations imposed by linkage do not occur, except possibly in cases where the mutual bonds in the sets are too strong to permit lateral exchange, synapsis may be only end to end, or other interferences such as inversions prevent normal multigenic exchange. If lateral exchange does not occur then the multigenic sets will be distributed in monogenic fashion.
It is suggested that multigenes very probably evolved from monogenes. The sets have been formed, it is suggested, by an increase in the number of monogenes; the number of genes at a locus appears to have increased without a corresponding increase in accommodation for them at this locus in the linear file. In the evolution of the chromosomes, increase

in length has possibly occurred by addition of new monogenes and in breadth by the formation of multigenes.
The occupation of the intrachromosomal position in the linear file is a matter of chance; on the whole, all members of the set are eligible for that position. Extrachromosomal genes may or may not influence the expression of the monogenes. In the case of genes determining carpel number in *G. herbaceum* factor interaction is restrictive, i.e. the extrachromosomal genes do not exert any differential influence. But possibly in other cases interaction may be nonrestrictive or cumulative; in general the latter type of reaction is believed to be the more common.
Sections III to XII give a very detailed exposition of the data obtained, in their chronological order so that the development of the hypothesis may be understood. The introductory section and section XIII outline the features of multigenic inheritance. Possible causes for character correlations are noted and the bases of blending inheritance examined. It is argued that the multigenic mechanism provides the means of maintaining heterozygosity in inbred lines. The blending of inheritance and establishment of intermediate forms with relative stability raise problems requiring mathematical analysis and interpretation, e.g. problems of variation in natural populations.
In the final section some of the conclusions are discussed in general and unsolved problems indicated, reference being made to: problems of analysis of continuous or quantitative variation; gene interaction in multigenic characters; number of genes in sets; the light the theory of multigenic inheritance possibly throws on the role of genes in ontogenesis; the bearing of the author's theory of multigenes on gene reproduction; previous investigations on quantitative characters in maize and tomato and their limitations as a result of analysis solely upon the basis of the monogenic concept; the hypothesis of multiple factors, criticized on the grounds that it does not solve the problem of the spatial organization of quantitative or polygenic systems; heterosis and dominance; and somatic recombination and lateral exchange.

1480. Alcaraz Mira, E.
Análisis estadístico en la herencia por factores múltiples. (**Statistical analysis of inheritance by multiple factors**).
Bol. Inst. Nac. Invest. Agron., Madr. 1950 : **10** : 613–23.

Formulae are presented for the distribution in the F_1 of the genotypes and phenotypes to be expected with regard to the inheritance of a character determined by multiple genes (*a*) after selfing and (*b*) after outcrossing.

1481. Dittrich, W.,
Höhne, G.,
Paul, W. and
Schubert, G.
Über die Auslösung rezessiv-geschlechtsgebundener Letalfaktoren bei *Drosophila* durch schnelle Elektronen eines 6 MeV-Betatrons. (**On inducing recessive lethal sex-linked factors in *Drosophila* by high speed electrons of a 6 M.e.V. betatron**).
Naturwissenschaften 1950 : **37** : 545–46.

The effects of high speed electrons (2 to 6 M.e.V.) and of X-rays (200kV) were investigated by determining the percentage of recessive sex-linked factors induced in *D. melanogaster* and comparing the proportions found with the already known proportions of mutations which occur in the X-ray and radium range of radiations. A graph of the authors' results shows the dependence of the percentage of mutations on the electron dosage, and a second graph, derived by Timoféef-Ressovsky from his own results and those of other investigators, shows the effect of using very soft to hard X-rays, γ-rays and β-rays of radium to induce the mutation. The course of these two curves is very similar. From considerations of current theory on the effect of density of ionization in various types of rays when used to irradiate biological material the authors show that the relative effectiveness of high speed electrons

in causing mutation as compared with X-rays and γ-rays would deviate little from unity. The percentages of mutations observed are compatible with the assumption of a single hit reaction. Taking the magnitude of the errors inherent in the method into account, it cannot be assumed that the deviation of the authors' curve from Timoféef-Ressovsky's represents a real difference between the effectiveness of high speed electrons and that found by plotting the results from γ-rays and β-rays.

1482. Bhat, N. R.
Procedure for the measurement of linkage between characters determined by dissimilar factors with complete dominance.
Indian J. Genet. Pl. Breed. 1950 : **10** : 21–27.

The method of detecting linkage or independence of any two characters determined by dissimilar factors and, if linkage exists, the procedure of ascertaining which particular factors of those responsible for the two characters are linked, form the subject of this discussion. A simple method of deriving expectations of phenotypic frequencies in terms of the recombination fraction is described.

1483. Schwemmle, J.
Plastiden und Genmanifestation. (**Plastids and gene manifestation**).
Flora, Jena 1943 : **37** : 61–72.

The behaviour of the *T* factor, which affects petal spotting in *Oenothera Berteriana*, was studied in reciprocal crosses between that species and *Oe. odorata*. The results are provisionally interpreted as a case of inactivation of a factor under the influence of the plastids contained in foreign cytoplasm. The inactivation appears to be gradually reversible, if the factor is again transferred to its original cytoplasmic environment. It seems likely that the cytoplasm, as distinct from the plastids, plays no role or a relatively small one in the above two phenomena.

1484. Satina, S.,
Rappaport, J. and
Blakeslee, A. F.
Ovular tumors connected with incompatible crosses in *Datura*.
Amer. J. Bot. 1950 : **37** : 576–86.

In incompatible interspecific crosses of *Datura* the formation of ovular tumours in fertilized ovules prevents hybridization. The rate and intensity of tumour growth depend upon several factors, including the species and races used in the crosses. Seeds resulting from self pollination show a decreased content of starch and an increased content of fat and aleurone grains during embryo development; a reverse situation occurs in ovules developing from incompatible crosses. Tumoral tissues and contents of the embryo sac from incompatible crosses appeared to exert an inhibitory effect on embryo growth, when added to cultures of normal embryos of *Datura*.

1485. Taschdjian, E.
The evolution of the Mendelian concept of "anlage".
Genetics 1950 : **35** : p. 696. (Abst.).

A comparison is made between the meaning ascribed to the term Anlage in Mendel's original publication and the translation of the word by Bateson. The original meaning is said to be "disposition" or "design," whereas Bateson translated the word wrongly as "material." It is suggested that much of the sudden popularity of Mendel's principles at the beginning of the century was due to this erroneous translation, since it helped to lay the foundation for the early, relatively simple concept of the gene as an inert particle and the genotype as a mere agglomeration of such particles inherited by division and transfer from parent to offspring. Modern genetical work shows that the genotype is not a mere agglomeration of

units of inheritance but a formed entity, inherited by a copying process during which a new gene is built up out of assimilated material by the action of the parental gene. The modern view of the gene is therefore more akin to Mendel's original concept than to Bateson's interpretation.

1486. Beale, G. H.
Nuclear and cytoplasmic determinants of hereditary characters in *Paramecium aurelia*.
Nature, Lond. 1951 : **167** : 256–58.

The modes of inheritance of the antigen and killer systems in *P. aurelia* are compared. It is shown that nuclear, cytoplasmic and environmental factors interact in a totally different manner in the two systems. The specific determinants of the various types of the killer character are the κ particles in the cytoplasm, whereas the specific determinants of the antigens are certain genes in the nucleus. In each case, however, the specific determinants depend upon so-called non-specific factors for their expression. In the killer system the non-specific factors include the gene *K* in the nucleus, amount of food and temperature. In the antigen system the non-specific factors include some unidentified component of the cytoplasm and temperature. The term non-specific is used for any factor which favours not one particular kind of killer or antigen but a number of variants of the character in question. At present the nature of the hypothetical substances in the cytoplasm which are able to favour one series of gene controlled reactions in the antigen system and to inhibit others is unknown. These "substances" may be certain physicochemical conditions, definite chemical compounds, or complex aggregates with certain of the properties of genes. If these substances or conditions could be identified, understanding of cellular differentiation in the higher organisms would be advanced.

1487. Preer, J. R. (Jun.) and
Blauch, B. M.
Inheritance of resistance to paramecin, the killer substance, in variety 2, *Paramecium aurelia*.
Genetics 1950 : **35** : p. 685. (Abst.).

Approximately 30 stocks of variety 2 have been tested for resistance to paramecins produced by six killer strains. In most cases each stock could be distinguished from the others by its characteristic pattern of resistance and sensitivity to the six killers. The genetic basis for differences in the response exhibited by two κ-free stocks has been studied. The difference in response between κ-free stock 53 (more resistant to killer G) and κ-free stock 30 (less resistant to killer G) appeared to be due to a difference of at least three factors.

1488. Brücher, H.
Spontanes Verschwinden der Entwicklungshemmungen eines Artbastards. (**Spontaneous disappearance of the developmental disturbances of an interspecific hybrid**).
Flora, Jena 1940 : **34** : 215–28.

Epilobium species have been used in this contribution to the study of plasmatic inheritance, as exhibited in the marked differences observed in reciprocal crosses between *E. hirsutum* and *E. parviflorum*. These differences are attributed, not to the action of some inhibitory, unifactorial gene, but to the presence in each species of a cell plasma with genetically different action. It is shown that on occasion the growth anomalies characteristic of the *E. hirsutum* x *E. parviflorum* hybrid may fail to occur and possible explanations of how this may happen are discussed, e.g. by the action of environmental factors, or by the transference of cell plasma or plastids from the pollen parent into the ovum, with, at the same time, dissociation of the paternal plastids. Some evidence for such dissociation has been found in the occurrence of sectorial chimeras in the lateral branches of an *E. hirsutum* x *E. parviflorum* hybrid.

1489. Schwemmle, J.
Keimversuche mit alten Samen. **(Germination tests with old seed).**
Z. Bot. 1940 : **36** : 225–61.

In *Oenothera Berteriana* and to a lesser extent *Oe. odorata*, germination capacity declines with age of seed. This decline appears to be due to the formation of a growth inhibiting substance. In crosses between plants with different degrees of inhibited germination in the old seeds involving the above two species, reciprocal differences in germinability occur in the F_1.

1490. Subramaniam, M. K.
A genetical interpretation for the so-called Dauermodifikationen in ciliates.
Sci. and Cult. 1950 : **16** : 164–65.

It is suggested that dauermodifications in ciliates are due to mutation, but that the genes affected only achieve expression when reduplicated above a basic number in the macronucleus. Hence, a mutation in the micronucleus would only achieve expression when the micronucleus gives rise to a macronucleus. Reverse mutation in the micronucleus would similarly only achieve expression after the next autogamy or fertilization.

1491. Tanaka, Y.
(The causes of spontaneous mutation).
Bot. and Zool. 1940 : **8** : 53–59. [Japanese].

In this review, the author considers what light is thrown on spontaneous mutation by mutation induced by temperature treatment, ultraviolet rays, radioactivity, cosmic rays, seed storage, nutrient substances and alkaloids.

1492. Kendall, J.
The adventures of an hypothesis.
Proc. Roy. Soc. Edinb. 1949–50 : **64** : Sect. B : 182–98.

Following a discussion of Prout's Hypothesis, an hypothesis of the "coordination of constitutional changes in mass-energy-life" is presented, based on knowledge of the convertibility of one form of life to another by means of energy. Considering the cell as a unit analogous to a complex molecule and the chromosomes as its constituent groups, it is supposed that mutagenic reactions duplicate the various types of chemical reactions as follows: (*a*) the majority of spontaneous mutations may be regarded as equivalent to ordinary chemical changes with very low reaction rates and large temperature coefficients; (*b*) a small fraction of spontaneous mutations induced by accidental radiations are equivalent to photochemical reactions and, as such, do not exhibit any temperature coefficient; (*c*) artificial mutations induced by chemical agents, such as mustard gas, may be regarded as catalytic reactions, with the mustard gas functioning as the catalyst; these are characterized by large temperature coefficients; and (*d*) artificial mutations induced by irradiation are equivalent to photocatalytic reactions in which the rate is proportional to the intensity of the radiation and is much greater than that of reaction type (*b*).

1493. Ives, P. T.
Mutator genes as a major cause of gene and chromosome changes in natural populations.
Genetics 1950 : **35** : p. 672. (Abst.).

The results of investigations on *Drosophila melanogaster* have led the author to suggest the following hypothesis: the majority of gene mutations and chromosome rearrangements found in natural populations originate from the biochemical activity of mutators rather than from intramolecular thermal agitation; less active mutator alleles may be the cause of most spontaneous mutations in laboratory populations.

1494. Wright, S.
Discussion on population genetics and radiation.
J. Cell. Comp. Physiol. 1950 : **35** : (Suppl. 1) : 187–205.

A mathematical discussion is presented on the extent to which deleterious irradiation-induced recessive or dominant mutations are likely to affect a genetic population. While inadequate knowledge makes it impossible to draw definite conclusions, the author thinks it probable that cumulative doses of about the order of 300r may have important effects on such populations, while even doses as low as 30r may not be negligible.

1495. Auerbach, C.
Some recent results with chemical mutagens.
Hereditas, Lund 1951 : **37** : 1–16.

The results of experiments on the mutagenic effect of formaldehyde upon *Drosophila* are surveyed. Possibly free formaldehyde is the actual mutagen, as suggested by Rapoport, but the necessary, or at least the most favourable, conditions for its effect may be a slow release in only slightly toxic doses from labile compounds with protein, into the food medium, the digestive tract of the larvae or possibly into the germ cells themselves. Formalin, like mustard gas, is capable of inducing all known types of changes, i.e. dominant lethals, visible mutations, small and large deletions, inversions and translocations. It also resembles mustard gas, and differs from X-rays, in producing relatively few translocations as compared with lethals and in often exerting a delayed effect. Furthermore, the action of both formalin and mustard gas is associated with a sensitive period prior to the formation of mature sperm.
The similarity of chemical mutagens to ionizing radiations in producing chromosome breaks and genic mutations is discussed. The view is expressed that this similarity does not necessarily indicate a common primary mutagenic mechanism. Theories put forward to explain the mutagenic action of the mustard group of compounds are examined. The results obtained by the author do not give support to Bacq's hypothesis that mutations are produced by action on –SH groups in the proteins of the chromosomes or in the enzymes concerned with chromosome growth and reproduction. Nor do they support D. M. Needham's suggestion that poisoning of phosphate transferring enzymes may be the primary step in the production of mutations. Loveless and Revell (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 747) have postulated that the mustards produce chromosome breakage and mutation by forming cross links between neighbouring fibres of the chromosome; but although this concept has proved valuable as a working hypothesis, cross linkage does not appear to be an essential factor. Herriott's recent work on viruses suggests that the production of genetical effects by reaction of mustard gas with nucleic acids may play an important role. Finally, attention is drawn to certain similarities between chemically induced and so-called spontaneous mutations. Evidence of sensitive periods to natural causes has been obtained from the work of several investigators. It is noted that mutations have been produced in the laboratory by means of substances occurring in nature.

1496. D'Amato, F.
Mutazioni clorofilliane nell'orzo indotte da derivati acridinici. **(Chlorophyll mutations in barley induced by acridine derivatives).**
Caryologia, Pisa 1950–51 : **3** : 211–20.

An investigation on the mutagenic effect of (1) acriflavine, (2) acridine orange and (3) 9-aminoacridine upon the 2-rowed barley Aurora showed that the majority of treatments resulted in a slowing down of growth and thus reduced tillering capacity. A tabular analysis of the incidence of chlorophyll mutations in the F_2 shows that mutation was not at random, for *albino* mutations were absent, while the *viridis* type was quite frequent, and rare or extremely rare mutants such as *tigrina*-like and *maculata* also appeared.
It does not seem improbable that the resemblance between the mutagenic action of the acridine derivatives and that of mustard gas (cf. *Plant Breeding Abstracts*, Vol. XVIII,

Abst. 2233) may be connected with their common property of forming an irreversible precipitate with the nucleoproteins *in vitro*.

1497. D'Amato, F.
Recenti acquisizioni nel campo della chemiogenetica: i prodotti del ricambio organico come agenti mutageni. (**Recent advances in the field of chemical genetics: the products of organic metabolism as mutagenic agents**).
Caryologia, Pisa 1950–51 : **3** : 249–59.

In this survey of recent research on the cause of mutation in plants and animals the effects of the following substances as mutagenic agents are briefly recorded by reference to the experiments of the author and of other investigators: phenols, alkaloids, adenine and other purine derivatives, mustard oil, coumarin, desoxycholic acid, putrescine, and aqueous extracts of (1) aged seeds of *Oenothera* and (2) crushed onion.
In general the results tend to show that spontaneous mutation is a typically physiological process and not due to factors outside the organism.
In the author's opinion the effect of yperite on *Vicia Faba* shows convincingly that spontaneous chromosome mutation in this species is chemically induced.
Incidentally, a verbal communication of Hoffmann-Ostenhof is cited in which the mutagenic action of aqueous extract of onion is attributed to oxidation products of the constituents of the cell sap.

1498. Kaplan, R. W.
Mutation und Keimtötung bei *Bact. coli* histidinless durch UV und Photodynamie. (**Mutation and inhibition of the capacity to form colonies by the action of UV and ordinary light in the case of *Bacterium coli* histidineless**).
Naturwissenschaften 1950 : **37** : p. 547.

A simple method is described of determining percentages of mutations by counting the reverse mutations to prototrophy in the case of biochemical (= auxotrophic) strains of mutants. The method is demonstrated in a comparison of the mutagenic effect and bactericidal action, i.e. inhibition of the capacity to form colonies, produced by ultraviolet and ordinary light on a histidineless strain of *B. coli*.

1499. Kaplan, R. W.
Zur Frage des Unterschiedes zwischen Chromosomen- und Gen-Mutationen. (**On the question of the difference between chromosome and gene mutations**).
Naturwissenschaften 1950 : **37** : 546–47.

Barley grains, soaked for six hours in various liquids, were in each case treated with X-rays by irradiating with 7500 r., i.e. 130kV, for 120 minutes, with the aim of investigating whether a fundamental difference exists between mutations of chromosomes and of genes. The behaviour of F_1 plants which were sterile owing to chromosome mutation differed from that of plants obtained by selfing and, owing to gene mutations, exhibiting new hereditary characters in the F_2. It is, however, not yet certain whether the differences observed are due to a difference in the initial process of mutation or in the subsequent processes.
In a second series of experiments, dry barley grains received two X-ray doses, each of 3000 r., i.e. 150kV, twice for 56 minutes, with an interval of 48, 24, 15, and 0 hours between the two irradiations. The number of sterile plants was found to increase with the length of the interval between the doses, whereas the F_2 mutations showed no dependence on fractionated dosage. It is pointed out that a difference in the processes, e.g. failure of the break surfaces to combine in the case of gene mutation following the initial stage which induces mutation, might be related to the differences in the response of sterile plants and

F_2 plants to fractionated dosage; movement and reunion are occurring after irradiation throughout a longer period before the chromosome is finally re-formed and this conditions the effect of time intervals between the breaks on the result of extended periods of irradiation. The findings from these two series of experiments are held to be scarcely compatible with the identity of mutation processes in chromosomes and genes.

1500. YASUI, K.
Cytogenetic studies in *Melandrium album*. II. Di-tetra-mixoploid obtained by colchicine treatment.
Cytologia, Tokyo 1942 : **12** : 469–78.

Ditetramixoploid plants were obtained after treating seeds with 0·04% colchicine solution for 5 or 10 days; the manner of distribution of the diploid and tetraploid cells varied in different plants, sometimes taking the form of a complicated intermingling between areas of pure diploid and tetraploid tissue.
It was observed that diploid and tetraploid flowers differed in size, but not in shape, whereas flowers having intermingled cells differed in shape from those with pure diploid or tetraploid construction. Where intermingling occurred in the same microsporangium each type of pollen mother cell behaved independently; regular tetrads were formed in the diploid pollen mother cells; the irregular segregation in the tetraploid pollen mother cells produced many sterile gametes. This explains the predominance of diploid individuals amongst the progeny of ditetramixoploid forms.

1501. *WITTENROOD, H. G.
Lysenko's school over de entbastaarden. **(Lysenko's school on graft hybrids).**
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) **13** October, 1949 Wageningen : 284–90. (Mimeographed).

The speaker gave an historical survey of the views of Winkler and Daniel on graft hybrids, while pointing out the resemblance between the viewpoints of Daniel and Lysenko. Daniel believed that he had demonstrated the inheritance of the effect of the stock on the grafted scion.
The results claimed by Lysenko in his experiment of grafting a tomato variety with white fruit and tomato leaves on another variety with red fruit but potato-type leaves are attributed by the speaker to an admixture of seed from the scion with that of the stock. The speaker's view is that explanation of the phenomena should not be attempted until the results are known to be true.
It must be remembered that Lysenko's view supposes that everything in the plant varies continuously, while in modern genetical theory a constant genotype is held to underlie the labile phenotype.

1502. BRABEC, F.
Zytologische Untersuchungen an den Burdonen *Solanum nigrum-Lycopersicum*. **(Cytological investigations on the *S. nigrum-Lycopersicum* burdos).**
Planta 1949 : **37** : 57–95.

Using material from H. Winkler's (cf. *Plant Breeding Abstracts*, Vol. XIII, Abst. 1110) burdo cultures of *Solanum*, the author attempted to elucidate the nature of burdo structure with special reference to cytological aspects. From morphological and cytological examinations it was possible to identify two types of burdo, differing in their respective chromosome numbers both in the somatic and gametic phases. Possible theories that might explain the origin and structure of these two types and their genome composition are put forward.
Though the morphological features of the burdos strongly suggest hybrid origin, this could not be definitely confirmed cytologically.

1503. LYSENKO, T. D.
(On the agronomical teaching of V. R. Williams).
Agrobiologija (Agrobiology) 1950 : No. 4 : 3–20. [Russian].

The teachings of Williams are critically examined and some of his agrobiological errors are pointed out. These are found in his rather rigid instructions on the complex rotational system and are largely due to his disregard of differences in the climatic conditions in different districts. Williams's theory on ever-increasing soil fertility is not affected by the mistakes he made when advocating certain agricultural practices. These include some recommendations which have since become outmoded and erroneous generalizations such as that the cultivation of spring wheat is preferable to that of winter wheat. The need for improvements in both kinds of wheat is stressed, and in the Ukraine, the Crimea and northern Caucasus the shortage of winter wheats is regarded as especially acute. The aims of the breeder should be large eared lodging resistant varieties producing between 40 and 50 c. per ha.

1504. *PRAKKEN, R.
Een genetische beschouwing over de theorie van Lysenko. **(A genetical review of Lysenko's theory).**
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) 13 October, 1949 Wageningen : 290–95. (Mimeographed).

The well known views of Lysenko (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 2000) on the effect of internal and external environment on inheritance in the organism are reviewed with special reference to their bearing on the inheritance of acquired characters.

1505. CRESCINI, F.
Limiti di efficienza della selezione massale in fitotecnia. **(Limits of efficiency of mass selection in plant breeding).**
Humus, Milan 1950 : **6** : No. 11 : 3–6.

The various types of mass selection and their application to plants are explained with special reference to (1) the mode of reproduction prevailing in the particular population, and (2) the dominance or recessiveness of the character concerned.
Mass selection, carried out once or repeatedly, can be most suitably used to obtain (*a*) progenies phenotypically uniform for one or two characters, provided that multiplication is asexual; or (*b*) progenies homozygous for one or more recessive characters where multiplication is autogamic or allogamic. But mass selection is not so effective when selection relates to dominant homozygotes or heterozygotes in autogamous or allogamous progenies. In such cases individual selection for pure lines, pedigree selection repeated annually after selfing the selected plants, or selection of pairs for crossing *inter se* in the case of diecious species are recommended.

EVOLUTION

1506. OPARIN, A. I.
(The problem of the origin of life in the works of the contemporary adherents of Mendel and Morgan).
Interagra, Prague 1950 : **4** : 188–215. [Russian].

The full text of a lecture delivered at the Czechoslovak Academy of Agriculture is presented. Soviet materialist hypotheses on the origin of life conforming with Lysenko's biological teaching are expounded and contrasted with what are described as vitalist, idealist and mechanical explanations of life and its origin.

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* An extended summary is on file at the Bureau.

1507. Saez, F. A.
Genética y evolución. **(Genetics and evolution).**
Ciencia e Investigación, B. Aires 1950 : **6** : 531–39.

A general outline is given of the neo-Darwinian theory of evolution.

1508. Brücher, H.
Experimentelle Untersuchungen über den Selektionswert künstlich erzeugter Mutanten von *Antirrhinum majus*. **(Experimental investigations on the selection value of artificially produced mutants of *A. majus*).**
Z. Bot. : **39** : 1–47.

As a contribution to the question of the importance of gene mutation as a factor in phylogeny, *Antirrhinum* mutants from Erwin Baur's collection were compared under experimental conditions with their parent form, race 50, to find out whether they differed from it in vitality or requirements as to climate.
Evidence was obtained showing that some mutants had in fact a higher survival value than the ordinary form from which they arose.

*CYTOLOGY

1509. Lepešinskaja, O. B.
(Life processes during the period previous to the development of cell structures).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) Ser. Biol. 1950 : No. 5 : 85–101. [Russian].

The results of investigations into the origin of cells at the Cytological Laboratory of the Institute of Experimental Biology of the USSR Academy for Medical Sciences (cf. *Plant Breeding Abstracts* XX, Abst. 2056) contradict the mechanist and idealist hypotheses of Virchow, Weismann, Mendel and Morgan. On the other hand they confirm the theses of Engels that (*a*) non-cellular organisms develop from simply organized masses of protein, (*b*) the nucleus and nucleolus are differentiated from protein, and (*c*) life is present wherever there is protein substance which is not in the process of decomposition. Recent research by Sorokin, Krjukov, Mihin, Suknev, Bošjjan, Lavrov, Galustjan, Makarov, Nevedomskiĭ, Morozov, Harvey and Gravic supports the author's evidence.
A study of the origin of cells from proteins is in progress. Simultaneous work on the hybridization of proteins is being carried out.

1510. Sharma, A. K. and
Ghosh, C.
Oxyquinoline—as an ingredient in a new fixative for chromosome analysis.
Sci. and Cult. 1950 : **16** : 268–69.

A technique for making permanent preparations involving 8-oxyquinoline is described. The material is fixed in a mixture of 1 part ·002 M aqueous solution of 2-oxyquinoline, 3 parts 1% chromic acid and 6 parts 10% commercial formalin, mixed just before use. The material is kept in the fixative for $1\frac{1}{2}$–$2\frac{1}{2}$ hours at 15° C. and then left at room temperature overnight.

1511. Tanaka, N.
(Valap, a new substance for sealing acetocarmine preparations, providing a simple method for rendering them permanent).
Bot. and Zool. 1939 : **7** : 1449–50. [Japanese].

Acetocarmine preparations may be sealed with Valap, a mixture of 2 parts yellow vaseline: 2 parts lanoline : 1 part paraffin. Such preparations may be made into permanent preparations later if required.

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* General studies, see also individual crops.

1512. Soyano, Y.
(A colchicine smear method involving treatment with colchicine).
Bot. and Zool. 1940 : **8** : 927–28. [Japanese].

The technique is as follows. Root tips are treated with 0·05% colchicine for 304 hours. The material may then be fixed in Karpechenko's fluid for 30–60 minutes, washed in water for 30 minutes, immersed in 4% NH_4OH at 60° C. for 15 minutes, washed a second time in water for 30 minutes, and then treated with N/HCl at 60° C. for 8 minutes; alternatively, it may be fixed by boiling in acetic alcohol for two minutes, followed by treatment with N/HCl at 60° C. for 15–20 minutes. The material is then stained with acetocarmine after both fixation treatments.

1513. Newcomer, E. H.
Mitochondria in plants. II.
Bot. Rev. 1951 : **17** : 53–89.

Progress in research on cytoplasmic inclusions, particularly mitochondria, during the past ten years is reviewed. The advantages and limitations of the more orthodox morpho-cytological techniques of fixation and staining are summarized, with emphasis on the need for new fixatives.

1514. Northen, H. T.
Alterations in the structural viscosity of protoplasm by colchicine and their relationship to c-mitosis and c-tumor formation.
Amer. J. Bot. 1950 : **37** : 705–11.

Using the centrifuge method, the structural viscosity of the cytoplasm and spindle material was determined in onion root tips which had been immersed in 0·01, 0·05 and 0·1% aqueous colchicine solutions for periods of ½ to 48 hr. All concentrations of colchicine produced a decrease in the structural viscosity of the cytoplasm and spindle substance. The decrease in the viscosity of the cytoplasm was most marked in root tips treated with colchicine for 24 hours or longer; this decrease was paralleled by the formation of c-tumours. It is suggested that the decreased structural viscosity conditioned by the colchicine was probably the result of dissociation of protoplasmic proteins. The dissociation of the proteins of the spindle is regarded as the primary cause of arrest of mitosis at metaphase, and the dissociation of the proteins of the cytoplasm as the chief cause of c-tumour formation.

1515. Yamaha, G. and
Ueda, R.
(On the influence of supersonic waves on the root tip cells of the broad bean).
Bot. and Zool. 1939 : **7** : 1001–07. [Japanese].

A fuller version of this paper in German has already been reviewed in *Plant Breeding Abstracts*, Vol. IX, Abst. 1392.

1516. Lumb, E. S.
Cytochemical reactions of nucleic acids.
Quart. Rev. Biol. 1950 : **25** : 279–91.

The validity of cytochemical techniques commonly used for studying nucleic acids is discussed. Special consideration is given to (1) the specificity of the chemical reaction involved, (2) the accuracy and ease with which the reaction product may be detected, (3) the degree of protoplasmic distortion, (4) the extent to which the protoplasmic constituents or the reaction products are diffusible, and (5) the degree to which the reacting groups come into contact with each other. Further considerations necessary for accurate quantitative determinations are outlined.

1517. McDonough, E. S. and
Rowan, M.
A study of the effects of crystalline desoxyribonuclease on the salivary gland chromosomes of *Drosophila melanogaster*.
Genetics 1950 : **35** : p. 680. (Abst.).

Examination with a phase-contrast microscope showed that the structural continuity of chromosomes treated with crystalline desoxyribonuclease was not destroyed, the banded regions still being present. Chromosomes treated for as long as 2 hours were similar in appearance to untreated ones. These results provide evidence that desoxyribonucleic acid in itself is not an essential structural component of the chromosome, bringing into question the suggested relationship between desoxyribonucleic acid and the gene.

1518. Sharma, A. K.
Chromosome chemistry and the recent techniques for its study.
Sci. and Cult. 1950 : **16** : 134–42.

Recent work on the chemistry of the chromosomes is reviewed, particular attention being devoted to the Feulgen reaction, ultraviolet absorption studies, histochemical tests, chromosome extracts, enzyme treatment of chromosomes, the fibrous structure of the chromosomes, photometric investigations, and substances affecting nuclear division.

1519. Yasuzumi, G. and
Sawada, H.
Researches on mineral salts in the salivary gland chromosome.
Cytologia, Tokyo 1950 : **15** : 295–98.

By means of microchemical reactions, incineration and electron microscopy, inorganic substances in the salivary gland chromosomes of *Drosophila virilis* were detected. Phosphates are localized in chromatin bands and potassium salts are present in the matrix; calcium was detected only in the cytoplasm.

1520. Steinitz-Sears, L. M. S.
Cytochemical demonstration of the location of some protein-bound amino acids.
Genetics 1950 : **35** : p. 695. (Abst.).

The location of protein-bound arginine, histidine-tyrosine and tyrosine-tryptophane has been studied during mitosis and interphase, using modifications of Thomas's Sakaguchi reaction, the Pauly diazo reaction and Pollister's Millon reaction. No information is given on the material used.

1521. Haga, T.
Nucleolus-chromosome relationship in *Paris verticillata* MB., with special reference to the presence and absence of a satellite.
Cytologia, Tokyo 1942 : **12** : 479–85.

A new diploid caryotype, heterozygous for three chromosome pairs, is described; nucleolar characteristics were observed in this caryotype, in addition to four other diploid and two triploid caryotypes. It was shown that D-type chromosomes are nucleolar; those having a satellite develop a nucleolus interstitially at the region of the satellite stalk, whereas a nucleolus develops terminally at the naked distal end of the short arm in the chromosome which is deprived of its satellite. Irrespective of caryotypic alterations the maximum number of nucleoli in each nucleus corresponds to the number of nucleolar chromosomes, i.e. two in diploids and three in triploids.

1522. Avanzi, M. G.
Osservazioni sul ciclo nucleolare in *Cassia acutifolia* Delile. **(Notes on the nucleolar cycle in *C. acutifolia* Delile).**
Caryologia, Pisa 1950–51 : **3** : 200–03.

Not having sufficient material for a complete study of polysomaty in *C. acutifolia* Delile, the author confined her investigation to observations on the behaviour of the nucleolus in

mitosis in root tips. The movement of the persistent nucleoli towards the poles at metaphase is attributed to forces acting within the spindle of tactoid structure.

1523. Oguma, K.
(Considerations on the form and composition of the chromosomes and on their arrangement during cell division, and proposals for some new terms).
Jap. J. Genet. 1942 : **18** : 205–30. [Japanese].

A threefold classification of the composition and behaviour of the chromosome complement is proposed, with special reference to animals.
Chromosomes are classified firstly according to the location of the centromere as either pleuromitic, with a diffuse centromere, or telomitic, with a localized centromere. Two categories of telomitic chromosome are recognized: orthotelomitic chromosomes, with a terminal centromere, and syntelomitic chromosomes with the centromere not terminal. Under the latter category, three subcategories are recognized, subtelomitic, submesomitic, and mesomitic chromosomes, where the centromere is subterminal, submedian and median respectively.
With regard to the variation in chromosome form within the complete chromosome complement, chromosomes are classified as isomorphic, dimorphic or polymorphic.
The disposition of the chromosomes at metaphase is classified as either radiate or circular.

1524. Himes, M. H.
Studies on the chemical nature of "sticky chromosomes".
Genetics 1950 : **35** : p. 670. (Abst.).

Two methods were employed to test for depolymerization of desoxyribose nucleic acid in microsporocytes of maize, homozygous for the sticky gene, and in *Allium Cepa* root tips treated with ethylene glycol and hot water: (1) photometric determinations of the amounts of methyl green and Feulgen dyes combined with the chromosomes; and (2) study of the relative loss of desoxyribose nucleic acid staining ability following three different treatments, viz. hot water, HCl and trichloracetic acid hydrolysis, and desoxyribonuclease digestion. No evidence was found in support of Darlington's view that stickiness of chromosomes is due to depolymerization of desoxyribose nucleic acid.

1525. Yuasa, A.
(The behaviour of the chromonemata in the life cycle of two species of ferns).
Bot. and Zool. 1941 : **9** : 185–93. [Japanese].

In the resting nucleus of *Adiantum Capillus-veneris* and *Pteris multifida* the chromonema is always double. During mitosis the two threads remain visible throughout metaphase, anaphase and telophase and in the subsequent interkinesis. At the beginning of meiosis the double structure soon becomes invisible, so that in diakinesis and metaphase each chromosome consists of two threads whose double structure is rarely discernible. The behaviour of the chromonemata in meiosis II agrees with that in mitosis.

1526. Tanaka, N.
Chromosome studies in Cyperaceae. VI. Pollen development and additional evidence for the compound chromosome in *Scirpus lacustris* L.
Cytologia, Tokyo 1940 : **10** : 348–62.

Details are given of meiosis and pollen development in *S. lacustris* var. *typicus* which has two compound chromosomes showing normal pairing and often forming a bridge at first telophase. The bridges always have a sagittate form showing clearly the presence of more than one spindle attachment. The large compound chromosome is thought to be the equivalent of three small chromosomes.

1527. Krivshenko, J. D.
The structure of the heterochromatic part of the Y-chromosome in *Drosophila buscki*.
Proc. Nat. Acad. Sci., Wash. 1950 : **36** : 703–07.

A translocation between the Y chromosome and an autosome in *D. buscki* is described, which has provided a means of studying the structure of a considerable part of the heterochromatic region of the Y chromosome in salivary gland preparations. This inert region resembles an euchromatic chromosome in size and in having clear cut bands, but is much more transparent than euchromatin and takes up almost no stain. The bearing of this observation upon the genetic nature of heterochromatic segments is discussed.

1528. Hinton, T. and
Ellis, J.
A nucleic acid requirement in *Drosophila* correlated with a position effect.
Genetics 1950 : **35** : 670–71. (Abst.).

The wild type of *D. melanogaster* does not require nucleic acid or any of its derivatives for growth. Strain Inversion (2LR) 40d, carrying an inversion in chromosome II with one break in the heterochromatin resulting in a change in the appearance of the eye, requires the nucleic acid derivative, adenine. The adenine requirement is a property of the chromosomal inversion. The degree of phenotypic expression of the inversion varies inversely with the amount of nucleic acid in the medium. The heterochromatic position effect therefore appears to be correlated with an inability to synthesise nucleic acid.

1529. Yasuzumi, G. and
Yoshida, Y.
The differential staining of heterochromatin and euchromatin of the salivary gland chromosome with neutral violet.
Cytologia, Tokyo 1950 : **15** : 255–58.

Differences in the chemical composition of euchromatin and heterochromatin are demonstrated by staining with neutral violet; by means of the oxidizing activity of supersonic vibration, euchromatic bands appear purplish blue while the heterochromatin region remains purplish red.

1530. Karasawa, K.
(On higher plants having three haploid chromosomes).
Jap. J. Genet. 1942 : **18** : 314–19. [Japanese].

The cytology of species of *Crepis, Zacyntha, Callitriche, Arabidopsis* and *Crocus* with $n = 3$ chromosomes is reviewed.

1531. Oehlkers, F.
Zytologische und zytogenetische Untersuchungen an *Streptocarpus*.
(Cytological and cytogenetic investigations on *Streptocarpus*).
Z. Bot. : **39** : 113–53.

The author reviews the results of cytological investigations by himself and other workers on *Streptocarpus*. Special reference is made to chromosome number determination; mitosis and meiosis; the induction of hypodiploid forms in the X_1 after irradiation; and colchicine induced autotetraploids and allotetraploids differing in the number of polyvalents present.

1532. Sinoto, Y. and
Sato, D.
(The basic caryotype and its analysis).
Bot. and Zool. 1940 : **8** : 589–96. [Japanese].

A review is presented of methods for determining the basic caryotypes of plants and their theoretical significance.

1533. Matsuura, H.
(Problem of the secondary association of chromosomes).
Bot. and Zool. 1939 : **7** : 1665–71. [Japanese].

Secondary association has been recognized by workers in the author's laboratory in plants belonging to 30 genera and 45 species, including *Carex pilosa*, in which it has been observed for the first time. Secondary pairing frequently occurs after late telophase in cells of the anthers of *Veratrum oxysepalum* ($n = 16$), so that the chromosome number is halved. The force leading to secondary pairing is thought to be essentially the same as that causing somatic pairing.

1534. Leite-Rio, L. F.
Estudos de citologia experimental. I. Contracção dos cromosomas pelos catiões. **(Studies in experimental cytology. I. Contraction of chromosomes by cations).**
Bol. Soc. Portug. Cienc. Nat. 1949 : **2** : 111–38.

The effect of a 0·0375 M solution of KCl on root tips of *Allium Cepa* was a contraction of the chromosomes and an almost complete suppression of anaphases. Equimolar solutions of other potassium salts had similar effects, though in somewhat lesser degree; the chlorides of Al, Ba and Mg had a more pronounced effect, and those of Na and Li a less pronounced effect than KCl. The effects of all salts were more pronounced at pH 5·5 than at pH 7. The analogy between the phenomena of chromosome contraction here observed and the gelification of a sol or a complex gel suggests that the contraction is the result of dehydration of the complex gel constituting the calymma of the chromosome.

1535. Kater, J. McA.
Amitosis. II.
Bot. Rev. 1951 : **17** : 105–08.

Recent contributions to the study of amitosis are summarized. Among others, the work of Naidu and Baskshi, Srinath (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 1492) and Subramaniam and Ranganathan (cf. *Plant Breeding Abstracts*, Vol. XV, Abst. 1233) is significant; it indicates that some of the disagreements concerning mitotic and amitotic phenomena in yeast may be due to errors in current interpretations of the analogies between interkinetic yeast cells and cells of higher plants.

1536. La Cour, L. F.
Combined effects of X-rays and temperature on mitosis.
Nature, Lond. 1951 : **167** : 318–19.

In experiments on *Trillium grandiflorum*, a dose of 90r caused an increase in the speed of mitosis but low temperature slowed down mitosis by prolonging prophase. When combined, cold treatment and X-irradiation exerted supplementary effects; mitosis was slowed down still further or even suppressed. The suppressing effect was complete when irradiation occurred during the cold treatment. No chromosome stickiness was observed in any of the fixations made. Stickiness appears to be due to an effect upon prophase, possibly consisting of the superimposition of unpolymerized desoxyribose nucleic acid on the chromosome thread at this stage. Following X-irradiation at metaphase, no breakage occurred in the heterochromatin starved of desoxyribose nucleic acid as a result of the previous cold treatment. This result suggests that desoxyribose nucleic acid is not responsible for the prevention of the direct breakage of changed heterochromatin at metaphase.

1537. Avanzi, M. G.
Osservazioni sull'attività citologica di alcuni composti chimici. **(Observations on the cytological activity of some chemical compounds).**
Caryologia, Pisa 1950–51 : **3** : 234–48.

The cytological effects of the following substances upon root meristems of onions were investigated with special reference to their possible mutagenic properties: sodium desoxycholate, o-nitroanisole, m-nitro-p-toluidine, ammonium tungstate, ammonium vanadate,

cobalt nitrate, cadmium chloride, sodium cinnamate, and sodium phosphotungstate. A table is given showing the lethal effect, incidence of stickiness, c-mitosis, fragmented chromosomes and c-tumours, and the absence of mitoses.
Complete c-mitoses were caused after four hours only by o-nitroanisole in some concentrations; with other compounds total c-mitosis was prevented by their high toxicity.

1538. Walsh, M. P.
The effect of aminopterin on mitosis in *Allium cepa*.
Genetics 1950 : **35** : 698–99. (Abst.).

Root tips treated with a 0·001% solution of aminopterin for 1 to 1½ hours showed the usual c-mitotic effects. With longer treatments mitotic activity steadily decreased and at 18 hours mitosis was completely inhibited. With higher concentrations c-mitotic effects were rarely observed and mitotic activity ceased after 3–10 hours. Possibly enzyme disruption plays an important part in producing some of these cytological effects.

1539. Brauer, I.
Experimentelle Untersuchungen an Wurzelspitzen-mitosen von *Vicia Faba*. I. Normalverhalten. (**Experimental investigations on root tip mitoses of *V. Faba*. I. Normal behaviour**).
Planta 1949 : **36** : 411–23.

Brauer, I.
Experimentelle Untersuchungen an Wurzelspitzenmitosen von *Vicia Faba*. II. Mitteilung. Einfluss des Mediums. (**Experimental investigations on root tip mitoses of *V. Faba*. Communication II. Influence of the medium**).
Ibid. 1949 : **36** : 466–7.

The division rate, the incidence of the various stages of mitosis and a new criterion, chromosome length, were used in an investigation on the influence of various factors on mitosis in root tips of *V. Faba*. The first paper of the series records in detail the normal chromosome behaviour, and the second the behaviour in different media.

1540. Brauer, I.
Experimentelle Untersuchungen an Wurzelspitzenmitosen von *Vicia Faba*. III. Mitteilung. Einfluss der Temperatur. (**Experimental investigations on root tip mitoses of *V. Faba*. Communication III. Influence of temperature**).
Planta 1950 : **38** : 91–118.

Mitosis was studied in root tips of *V. Faba* after: (1) exposure to a temperature of 5° C.; (2) exposure to 30° C.; or (3) a shock treatment involving alternating temperatures of 5° and 30° C. Alterations were induced by all treatments in timing of mitosis and in chromosome length. The shock treatment also caused some chromosome fragmentation.

1541. Brown, R.
The effects of temperature on the durations of the different stages of cell division in the root-tip.
J. Exp. Bot., Lond. 1951 : **2** : No. 4 : 96–110.

A new technique of determining the duration of the different stages of mitosis is described, using seedling roots of peas. At 15° C. the mean durations were as follows: interphase, 23 hours; prophase, 2 hours; metaphase, 25 minutes; anaphase, 5 minutes; and telophase, 22 minutes. All stages were accelerated by an increase in temperature from 15° to 25° C.; this result suggests that at all stages within this temperature range the rate of mitosis is controlled by enzyme dependent processes.

1542. Geissler, G.
Über die durch Mitosegifte, Wuchs- und Keimungshemmstoffe hervorgerufene Keulenbildung an Zwiebelwurzeln. (**On club formation in onion roots induced by mitotic toxins and substances inhibiting growth and germination**).
Naturwissenschaften 1950 : **37** : 563–64.

The concentrations were determined at which colchicine, p-dichlorobenzene, aurantia, α-naphthyl acetic acid, coumarin and auramine each cause no club formation in the root tips of onions. Then, the action of solutions containing two of the above substances in all possible combinations at inactive concentrations was tested as regards club formation. Any pairs of the substances colchicine, aurantia, p-dichlorobenzene and coumarin caused club formation; from this result it is concluded that the substances may replace each other. The pair α-naphthyl acetic acid and auramine showed no combination effect, from which fact the author concludes that Bauch's theory of the reaction producing club formation due to growth substances is still unproved.
Prontosil, which inhibits the action of colchicine in club formation, showed a similar effect with coumarin. Thus, using the combinations (1) aurantia + colchicine and (2) aurantia + coumarin and adding prontosil in each case, the usual club formation did not occur, since one of the partners in each pair was put out of action and the other was present at too low a concentration to produce an effect.
The shape of the club formations was found to differ according to whether colchicine, p-dichlorobenzene or coumarin was used.
From the evidence so far obtained the author thinks that the different substances only induce one single reaction chain which leads to club formation, but that the kind of substance used regulates the development of the form and structure of the club on the root tip.

1543. Chiarugi, A.
Un Italiano fin dal 1889 osservò l'azione della colchicina sulla mitosi. (**An Italian as early as 1889 observed the action of colchicine on mitosis**).
Caryologia, Pisa 1950–51 : **3** : 260–62.

Citations from a paper in Sicilia Medica I (4), published in 1889, show that the Italian R. Pernice anticipated by 45 years modern discoveries on the action of colchicine on mitosis.

1544. Suita, N.
Studies on the male gametophyte in Angiosperms. VII. The mechanism of the karyokinesis and cytokinesis in the pollen tube. (A preliminary report).
Cytologia, Tokyo 1943 : **13** : 118–19.

Observations made during the division of the generative cell and on subsequent activities within the pollen tube until the death of the tube cell have shown that the delay of cell plate formation until after nuclear division is peculiar to generative cell division; the cell plate normally forms at late anaphase in somatic plant cell divisions. Whereas a solid partition wall of cellulose begins to develop after normal mitosis when the daughter nuclei enter into the resting stage, no stable membrane forms at or after this corresponding stage during division of the generative cell.

1545. Kuwada, Y.
Studies of mitosis and meiosis in comparison. I. A morphological analysis of meiosis.
Cytologia, Tokyo 1940 : **11** : 217–44.

The nature and mechanism of meiosis are discussed, various meiotic irregularities being taken into account. Meiosis is regarded morphologically as a double mitosis and prophase I as a double prophase. Physiological conditions may cause the chromosome pairing that

gives rise to the double prophase or the prolongation of prophase. This prolongation of prophase may upset the time relationship between chromosome development and spindle formation, thus resulting in the disjunction of the paired chromosomes instead of the separation of the divided chromosomes and in the occurrence of an additional chromosome separation involving the divided chromosomes. Different theories regarding chromosome pairing are considered and a modification of Darlington's principle of attraction between single chromosomes and repulsion between pairs is suggested.

1546. Wiebalck, U.
Untersuchungen zur Physiologie der Meiosis. XI. Reifeteilung und Kohlehydratspiegel der Pflanze. (**Investigations on the physiology of meiosis. XI. Maturation division and carbohydrate content of the plant**).
Z. Bot. 1940 : **36** : 161–212.

The course of meiosis was investigated in inflorescences of *Campanula persicifolia* and *Lilium candidum* cut and immersed in water or glucose solutions of various strengths under a range of environmental conditions. It was ascertained that for meiosis to take place, a certain minimum content of carbohydrate is necessary in the mother cells. It is believed that it is the somatic pressure of the carbohydrate that is the determining factor. Temperature also affects the course of meiosis. Accelerated meiosis, higher osmotic pressure and strong chromosome contraction tend to result in anasynapsis. The reverse conditions tend towards desynapsis.

1547. Shimamura, T.
On the mechanism of nuclear division and chromosome arrangement. VI. Studies on the effect of the centrifugal force upon nuclear division.
Cytologia, Tokyo 1940 : **11** : 186–216.

Observations on meiosis in pollen mother cells of *Lilium japonicum* subjected to centrifugal force are discussed. From the difference of behaviour between the two anaphase groups of chromosomes it is concluded that the anaphase chromosomes are held by the traction fibres, i.e. spindle fibres connecting the chromosomes with the poles, and that these traction fibres exist in the spindle *in vivo*.
In young root tips of *Vicia Faba* and *Allium Cepa* treated with chloral hydrate or colchicine no spindle fibres were formed, and centrifuging caused the chromosomes to be thrown towards the centrifugal side of the cell irrespective of the relative positions of individual chromosomes. It is concluded that the movement of the chromosomes towards the poles takes place by the aid of the spindle fibres which are indispensable in nuclear division, and also that there are no connecting fibres stretching between the two diverging groups of chromosomes.

1548. Battaglia, E.
Considerazioni sopra i più noti reperti di "fenomeni meiotici" in tessuti somatici. (**Considerations on the best known findings regarding "meiotic phenomena" in somatic tissues**).
Caryologia, Pisa 1950–51 : **3** : 79–112.

A review is given of the literature on "meiosis" in somatic tissues in animals, with a special section on effects of carcinogenic substances, and also in plants.
In the author's opinion there is incontrovertible evidence of the relatively frequent development of gametophytes and normal embryos from somatic cells of the nucellus in *Hieracium Hoppeanum*.
Unique and somewhat different instances of somatic meiosis are afforded by *Sambucus nigra*, *S. Ebulus* and *S. racemosa*, and probably also *Adoxa moschatellina*, in which the gland cells at the base of the stylar canal regularly undergo meiosis in the course of their development.

1549. Battaglia, E.
Sulla terminologia dei processi meiotici. 2° contributo: meiosi nei coccidî (Coccidae-Homoptera). [**On the terminology of the meiotic processes. 2nd contribution: meiosis in the coccids (Coccidae-Homoptera)**].
Caryologia, Pisa 1950–51 : **3** : 47–71.

In continuation of his attempt (cf. Abst. 69) to coordinate the normal and abnormal phenomena of meiosis and to devise for them a common terminology applicable to the plant and animal kingdoms, the author here reviews the meiotic processes observed in the coccids, in which the absence of a localized centromere is typical. Where this characteristic is present, chromosome fragmentation may provide a simple mechanism whereby new biotypes with a different chromosome number from the parent form may arise.

1550. Matsuura, H. and
Haga, T.
Chromosome studies on *Trillium kamtschaticum* Pall. X. On the origin of the chiasma.
Cytologia, Tokyo 1942 : **12** : 397–417.

It is assumed that kinetochore pairing, as distinct from the formation of chiasmata, is primarily responsible for the maintenance of bivalents; on this basis a comparison was made of the frequency of metaphase chiasmata in one plant with that in four other plants subjected to high temperatures prior to metaphase. Large increases in chiasma frequency were observed in the four treated plants.
Two types of bivalents were distinguished as follows: (*a*) K-bivalents, in which the kinetochores of the homologues remain paired until metaphase and chiasmata may or may not be formed, and (*b*) k-bivalents, in which the kinetochores are unpaired at metaphase and chiasmata are alone responsible for the maintenance of bivalents. In K-bivalents, the frequency of interstitial chiasmata is a function of arm length, while in k-bivalents it is a function of the entire length of the chromosome. It was inferred, from the negligibly low frequency of terminal chiasmata and their occurrence in relatively higher frequencies at the ends at which nucleoli are formed, that the chromosome matrix is responsible for the maintenance of terminal chiasmata.
With respect to the paired or non-paired condition of the kinetochores, K and k respectively, and the formation and non-formation of chiasmata, C and c respectively, it was concluded that a typical bivalent can be represented by the Kc condition, and that KC and kC bivalents are its derivatives.
This hypothesis favours the two-plane theory of chiasma formation, i.e. chiasmata are formed by the alternate opening out of sister and non-sister chromatids at diplotene and are not related, in their origin, to crossing over.

1551. Matsuura, H.
Chromosome studies on *Trillium kamtschaticum* Pall. XII. The mechanism of crossing over.
Cytologia, Tokyo 1940 : **10** : 390–405.

The mechanism of crossing over is discussed with reference to observations on *Trillium*, and a hypothesis to explain the process is presented, according to which crossing over occurs, not at early prophase, but at early metaphase in *Trillium* and early anaphase in *Tradescantia*.

1552. Matsuura, H.
Chromosome studies on *Trillium kamtschaticum* Pall. XIV. Primary and secondary chiasmata.
Cytologia, Tokyo 1941 : **11** : 380–87.

Chiasma development is discussed with reference to observations on pollen mother cells from plants incubated at 20° C. for about a week until meiotic metaphase began. Two

types of chiasmata are distinguished: primary chiasmata which are directly related to the development of interstitial repulsion, and secondary chiasmata which are controlled by the relation of the strength of the repulsion force to the surface tension and the viscous resistance set up by the matrix substance. The present findings and interpretations are at variance with the hypotheses of Darlington and his school regarding chiasma terminalization, chiasma interference in relation to crossing-over interference and terminal affinity (cf. *Plant Breeding Abstracts*, Vol. VII, p. 341).

1553. Matsuura, H.
Chromosome studies on *Trillium kamtschaticum* Pall. and its allies. XVII. A study of chromosome interlocking in *T. Tschonoskii* Maxim.
Cytologia, Tokyo 1944 : **13** : 369–79.

Interlocking of bivalents depends on two processes, viz. (*a*) the mode of chromosome pairing at zygotene, which determines its occurrence, and (*b*) the mode of chromatid opening-out at diplotene, which determines its retention. Observations of single interlocking indicate that the frequency of interlocking is proportional to the length of the chromosomal arm, assuming that the bivalent is of the K-type in which the pairing of kinetochores is complete (cf. Abst. 68). In the available material, four instances of double interlocking were analysed; in each, the central connexion of the two successive loops of the bivalent was caused by paired kinetochores and was not a real chiasma, i.e. was not the consequence of crossing-over.

1554. Harte, C.
Meiosis und crossing-over. Weitere Beiträge zur Zytogenetik von *Oenothera*. (**Meiosis and crossing over. Further contributions to the cytogenetics of *Oenothera*).**
Z. Bot. 1942/43 : **38** : 65–137.

Owing to the difficulty of subjecting the same plant to combined cytological and genetic examination, relatively little experimental evidence has been obtained to support the hypothesis that the chiasmata between homologous chromosomes in meiosis are to be regarded as the sites where genetic crossing over occurs.
The present account of experiments on the effects of lack of water and of temperature shock treatment upon the occurrence of chiasmata and crossing over in various *Oenothera*-complex combinations supports the assumption of a direct relation between these two phenomena. Though not incompatible with this conclusion, some anomalies in the results further suggest that there may also be secondary influences operating which require investigation.

1555. Ono, H.
Intergeneric hybridization in Cichorieae. VI. A hybrid of *Paraixeris denticulata* and *Lactuca squarrosa*.
Cytologia, Tokyo 1943 : **13** : 61–72.

From cytological studies of an intergeneric hybrid of *P. denticulata* and *L. squarrosa* it was concluded that the high frequency of pairing between the chromosomes of genera belonging to the Cichorieae, compared with other genera, could be explained by either of two hypotheses: (1) the chromosomes have many duplications and each contains at least one segment which is homologous with a segment of every other chromosome; thus pairing may occur between all chromosomes present in the nucleus; or (2) the abundant heterochromatic segments observed during prophase may have a pairing capacity such that non-homologous chromosomes become paired.

1556. Östergren, G.
The mechanism of co-orientation in bivalents and multivalents. The theory of orientation by pulling.
Hereditas, Lund 1951 : **37** : 85–156.

As a result of cytological investigations on a wide range of plant material and a comprehensive survey of the relevant literature, the author has reached the following interpretation of the behaviour of bivalents and multivalents during meiosis.
Coorientation is defined as the process of mutually correlated orientation of the kinetochores of chromosomes involved in a bivalent or multivalent association. The present hypothesis of coorientation may be alternatively termed the hypothesis of orientation by pulling. It is based upon the following points: (1) the kinetochore region is structurally differentiated with a special kinetic side; (2) the kinetochore is attracted towards that spindle pole towards which this side is orientated; (3) the kinetochores of univalents and bivalents attach themselves to the spindle; and (4) the supposition that the kinetochores can turn round and thus change their orientation in spite of the fact that they are attached to the spindle. When paired chromosomes first meet the spindle, they behave as univalents, i.e. they are distributed at random by active kinetochore movements directed towards the one pole or the other, or they may be found resting in a more or less indifferent manner on the spindle, in which case the kinetic granules are probably orientated simultaneously towards both poles. During these random movements the kinetochores of the paired chromosomes sooner or later exert a pull on their partners. This pull, in connexion with the one-sided arrangement of the kinetochore on the chromosome body, results in an orientation of the partner kinetochores towards opposite spindle poles, i.e. it produces coorientation. The attraction between kinetochore and spindle pole has been termed the *a* factor by the author (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 90 and 91); the mechanical nature of this attraction is however unknown. It is postulated that this mechanism explains not only the coorientation of bivalents and multivalents, but also the regular zigzag arrangements found in complex rings such as those of *Oenothera*.

1557. Makino, S.
Artificial induction of meiotic chromosome pairing in the somatic cell of *Drosophila virilis*. (Cytological studies on *D. virilis*. Pt. III.).
Cytologia, Tokyo 1942 : **12** : 179–86.

By keeping the larvae of *D. virilis* at an unfavourable temperature of 5° C. for 2–5 days mitotic division in ganglion cells is suppressed; many cells remain in a resting stage. This condition leads to the production of the haploid number of bivalent chromosomes by synaptic pairing of homologous chromosomes. The configuration of these induced bivalent chromosomes resembles that of the chromosomes during normal maturation of the primary spermatocyte. It appears that mitosis has been converted into meiosis by a retardation of the division process.

1558. Wilson, G. B.
Cytological effects of some antibiotics.
J. Hered. 1950 : **41** : 227–31.

Details are given of the cytological effects of penicillin G, streptomycin, neomycin, circulin, endomycin, actidione and streptothricin, chiefly on roots of *Allium Cepa*. In all cases indication of induced reductional groupings was obtained; only two of the antibiotics, however, viz. actidione and streptothricin, produced marked deviations from the usual mitotic behaviour. The deviations of most interest would appear to be failure of the metaphase-anaphase sequence and the reductional groupings; theoretically the former could lead to polyploidy and the latter to genetic segregation and haploidy; so far however neither of these possibilities has been demonstrated. It is pointed out that the antibiotics are in no way chemically related to those previously found to induce the reductional type of division in somatic cells. This fact apparently eliminates any possibility that nucleic acid or its phosphate radical is directly involved.

1559. Oksijuk, P. F.
(Anomalous mitoses in *Echium italicum* L. in connexion with a criticism of the theory of the individuality of the chromosomes).
Bot. Ž. (Bot. J.), Kiïv 1949 : **6** : No. 4 : 32–39. [Ukrainian].

The somatic chromosome number of *E. italicum* is $2n = 16$. Besides the cells with a diploid chromosome number, cells with a double number of chromosomes were observed in the periblem and in the dermatogen of the roots. But for rare exceptions these were arranged in pairs. The explanation of the origin of the cells with double chromosome number by a secondary division or doubling of the chromosomes is rejected and it is suggested that the chromosomes completely disappear in the dormant nuclei and are formed anew in early prophase, both at normal mitosis or at anomalous mitosis. However in the latter case they are immediately produced in a doubled number.
The development of the cells with doubled chromosomes is thought to be due to special biological conditions which arise in the specialized cells.

1560. Marquardt, H.
Die Röntgenpathologie der Mitose. III. Weitere Untersuchungen des Sekundäreffekts der Röntgenstrahlen auf die haploide Mitose von *Bellevalia romana*. **(The X-ray pathology of mitosis. III. Further researches on the secondary effects of X-rays on the haploid mitosis of *B. romana*).**
Z. Bot. 1941 : **36** : 273–386.

Extensive details are provided concerning the frequency of the different kinds of chromosome rearrangements induced by X-irradiation of *B. romana*. It is noted that raising the X-ray dose from 150 to 300r, increases the frequency of restitutions while not affecting the number of fragmentations. Breaks do not appear to reunite at random, certain combinations being favoured at the expense of others.
These results are discussed in the light of the author's theory that X-irradiation gives rise to a local surface instability in the chromosomes. If dividing nuclei are affected, the effect is termed primary and leads to chromosome fusions and fragmentations. If resting nuclei are affected, the effect is termed secondary and leads to a wider range of aberrations, in particular fragmentations and restitutions.

1561. Marquardt, H.
Die Bestimmung der Dosisabhängigkeit röntgeninduzierter Chromosomenveränderungen bei *Bellevalia romana*. **(The determination of the effect of X-ray dosage on chromosome alterations in *B. romana*).**
Z. Bot. 1941/42 : **37** : 241–317.

The curve relating number of restitutions to dose is quadratic; that connecting dosage and fragmentation frequency is linear at first, but flattens with higher dosages. The distribution of fragmentations and translocations in affected nuclei appears to be random.
The restitution curve is interpreted as a two-hit curve, the fragmentation curve as a one-hit curve. Restitution and fragmentation hits are regarded as qualitatively distinct phenomena. A restitution hit without a fragmentation hit gives rise to no visible alteration. Should the two types of hit however occur together, then total restitution may be expected. A fragmentation hit alone is likely to give rise to incomplete or complete breaks, injury in the environment of the break, or to single break restitutions.

1562. Sato, D.
(Recent advances in chromosome studies by means of X-ray and neutrons).
Bot. and Zool. 1941 : **9** : 383–90, 550–56. [Japanese].

A review is presented of recent work on chromosome aberrations induced by X-rays and neutrons, in particular the work of Sax and Marshak.

1563. Sax, K.
The effect of X-rays on chromosome structure.
J. Cell. Comp. Physiol. 1950 : **35** : (Suppl. 1) : 71–81.

In *Tradescantia*, the frequency of one-hit chromosome aberrations increases linearly with dose, while the frequency of two-hit aberrations increases with the square of the dose. At low dosages, the relation between two-hit aberrations and dosage tends to become linear. Experiments by the author indicate that the percentage of ring and dicentric chromosomes is related linearly to dose under constant exposure time.
The effect of centrifuging, supersonic radiation, temperature and infrared light on the frequency of X-ray induced chromosome aberrations is briefly discussed.

1564. Yost, H. T. (Jun.).
An analysis of combined infra-red and X-ray effects on *Tradescantia* chromosomes.
Genetics 1950 : **35** : p. 700. (Abst.).

Microspores were subjected to infrared radiation before and after X-ray treatment. In all cases increases of 50–120% in chromosomal aberrations were observed in the cells treated with infrared. Post treatments have been applied as late as 96 hours after X-irradiation with no apparent decrease in the effectiveness of the infrared treatment. It is therefore concluded that determination of the type of aberration produced, i.e. whether it has a chromosomal or chromatid origin, is independent of the time of recombination, and depends solely upon the singleness or doubleness of the chromosome at the time of X-ray treatment. Increases in chromatid aberrations induced by infrared radiation bear a non-linear relationship to dosage of infrared. It is stated that these investigations and others concerned largely with X-ray dosage relationships and spectral dependency have led to some conclusions on the mechanism by which infrared radiations produce their effect.

1565. Bishop, C. J.
The influence of polyploidy on the X-ray sensitivity of cells.
Genetics 1950 : **35** : p. 654. (Abst.).

Developing microspores and pollen grains of diploid and tetraploid species of *Tradescantia* were treated with equal doses of X-rays, at a time just previous to the prophase of pollen grain division and at a stage before chromosome doubling in the generative nucleus division. The results indicate that the sensitivity of the two types of cells to X-rays is the same, if the number of induced breaks per chromosome forms the basis of comparison; comparison of the number of breaks per cell shows that the cells of the tetraploid plants have approximately double the number of breaks found in the cells from diploid plants.

1566. Fabergé, A. C.
Relation between the action of cold and of nitrogen in decreasing the frequency of chromosome aberrations.
Genetics 1950 : **35** : p. 663. (Abst.).

Experiments on *Tradescantia* pollen have shown that nitrogen reduces sensitivity to chromosome aberration induced by X-irradiation if the radiation is applied at + 20° C. but no detectable effect if the radiation is carried out at — 191° C. Information, now available, on the effects of radiation upon *Tradescantia*, it is suggested, indicates that antithesis between the hypotheses of direct and indirect action of radiation lacks foundation. Experiments on the supplementary effects of oxygen or extreme cold suggest an indirect chemical step, possibly representing the spread of effect around an ionization cluster. In terms of the target theory, a factor of $5x$ in sensitivity represents a change of only $1{\cdot}7x$ in linear dimensions; geometrical theories therefore remain valid in principle.

1567. Bauer, H.
Die Entstehung von Chromosomenmutationen durch Röntgenbestrahlung. Eine Stellungnahme zu den Arbeiten von H. Marquardt. (**The origin of chromosome mutations by X-ray irradiation. A criticism of the work of H. Marquardt**).
Z. Bot. 1942/43 : **38** : 26–41.

Marquardt, H.
Zur Analyse röntgeninduzierter Chromosomenveränderungen und Chromosomenmutationen. (**On the analysis of chromosome changes and chromosome mutations induced by X-rays**).
Ibid. 1942/43 : **38** : 42–63.

In the first of the above two papers, the author claims to show that Marquardt's statistical and other evidence for his theory of the origin of chromosome mutation is not incompatible with the break theory commonly held.
The second paper contains Marquardt's detailed reply in defence of his view (cf. Abst. 813).

1568. Muller, H. J.
Some present problems in the genetic effects of radiation.
J. Cell. Comp. Physiol. 1950 : **35** : 9–70.

Some problems of the genetic effects of ionizing radiation are discussed, mainly with reference to experiments on *Drosophila*. It is generally accepted that the frequency of gene mutations and chromosome breaks is directly proportional to the dose of ionizing radiation received, and is independent of wave length and the time-intensity distribution of treatment. The possible validity of the Treffer or target theory, based upon the apparently simple proportionality between hit and gene mutation, is examined. It is pointed out that the frequency of mutations induced by radiation is not independent of genetic constitution and environmental factors accompanying the treatment. For this and other reasons the Treffer hypothesis appears to be inappropriate as a basis of calculating the size of the gene or the postulated "sensitive volume."
Chromosomal rearrangements are associated with changes in the functioning of genes, often including lethal effects, near the sites of breakage. The hypothesis of position effect as an interpretation of these changes is accepted by the author; new evidence is presented contradicting the views of Catcheside and Lea and of Herskowitz that the changes are instead the result of genic alterations associated with chromosome breakage. Consideration is given to the problem of why the frequency of lethals appears to remain proportional to the dose, even at high doses, in spite of the existence of lethals caused by the position effect of rearrangements. It is pointed out that probably the rise in frequency of lethals caused in this way is at least partly counteracted by the presence of lethals of another kind, due to small rearrangements, which with rising dose would increasingly come into combination with gross rearrangements and thus become irrecoverable as separate lethals.
New evidence on the mode of origin of induced chromosome changes is provided; data on ring chromosomes in *Drosophila* suggest that (1) a higher proportion of small deficiencies results from two breaks in the same chromosome or chromatid, followed by deletion of the interstitial part, than from exchange of unequal segments between sister chromatids; and (2) restitution occurs with a high frequency.
Arguments are put forward in support of the view that the distinction between gene mutations and chromosomal changes of any size is valid, although the two processes show certain similarities.
Attention is drawn to the need for information on the following problems, in the investigation of the amount, character and time distribution of the genetic effects of radiation upon populations: (1) the relative frequency of mutations which are neither fully lethal nor characterized by readily detectable visible effects, as compared with the ordinarily recorded lethals and visible mutations; (2) the average frequency of mutations at

individual loci and the approximate distribution of such frequencies; and (3) the average grade of dominance of mutations belonging to different categories, particularly of those ordinarily classed as recessives.

1569. Heinrich, H. L.,
Paul, W. and
Schubert, G.
Über die Wirkung von schnellen Elektronen (4 MeV) und Röntgenstrahlen (180kV) auf Mitosevorgänge in Wurzelspitzenzellen von *Vicia Faba*.
(On the action of high speed electrons (4 M.e.V.) and X-rays (180kV) on the processes of mitosis in the cells of the root tips of *V. Faba*).
Naturwissenschaften 1950 : **37** : 544–45.

Seeds of *V. Faba* were placed in a nutrient solution at 23° C. for two hours, transferred to a damp chamber for 72 hours, then planted in sawdust containing nutrient and 94 hours later irradiated with high speed electrons (4 M.e.V.) or X-rays (180 kV). The secondary roots were then removed and stained.
The diploid chromosome complement of *V. Faba* contains two large M chromosomes and ten smaller m chromosomes. After irradiation both kinds of chromosomes shorten by an amount which increases with increase of the dose; X-rays are more effective per unit of dosage than high speed electrons in causing this shortening. The percentage of dividing cells, as compared with the unirradiated control, decreases as the dose increases, this effect being more marked with X-rays than with high speed electrons. The biological activity of high speed electrons is 0·7 or 0·8 of that of X-rays, depending on the method of evaluation of this coefficient. The greater the dose the greater the frequency of disturbance of mitosis and again high speed electrons are less effective per unit of dosage than X-rays of 180 kV. From the curves showing the effect of different doses it seems probable that the reactions represent a multiple hit effect.

1570. Brown, S. W.
Spurious secondary association and asymmetric spindles in a *Luzula*.
Cytologia, Tokyo 1950 : **15** : 259–68.

Observations of sectioned material have shown that the apparent association of bivalents at metaphase in definite groupings is an artifact; the factors responsible are discussed. Asymmetric spindles in which the chromosome arrangement may be circular, triangular or in two definite rows have been found in sectioned material.

1571. Matsuura, H. and
Haga, T.
Chromosome studies on *Trillium kamtschaticum* Pall. VIII. On the mitosis-meiosis relationship.
Cytologia, Tokyo 1940 : **10** : 382–89.

Some heat induced abnormalities in pollen mother cells which seem to be directly related to the problem of the relation between mitosis and meiosis are described and discussed. The abnormal types of division are classified as (1) mitotic, in which ten univalents are present at metaphase instead of five bivalents, (2) supramitotic, characterized by the formation of 20 separate chromatids, and (3) ultramitotic, in which there are 40 separate half chromatids. The occurrence of the latter indicates that the chromosome at meiotic prophase consists of at least four separable chromonemata. Among both the meiotic and mitotic types of division there were corresponding "precocious" types in which the kinetochores were already split at metaphase and the two chromatids formed independent coils. It was shown that meiosis is convertible through the acceleration of cell activity into mitosis. This implies that the mechanism of meiosis differs from that of mitosis in the retardation of prophase, not in precocious chromosome development as is assumed by Darlington.

1572. Avanzi, M. G.
Frequenza e tipi di aberrazioni cromosomiche indotte da alcuni derivati dell' α-naftalene. (Frequency and types of chromosome aberrations induced by some α-naphthalene derivatives).
Caryologia, Pisa 1950–51 : **3** : 165–80.

A detailed account is given of the effects of α-methylnaphthalene, α-naphthylamine and α-naphthol on the root meristems of onion bulbs. The last two substances belong to the preprophase toxins (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 94), while α-methylnaphthalene produces typical c-mitoses, exerts a mutagenic effect and causes chromosome breaks in diploid and polyploid complements of chromosomes (cf. Abst. 88).
The occurrence of pseudochiasmata, not associated with stickiness, was observed and its interpretation is discussed.

1573. Sigenaga, M.
Experimental studies of abnormal nuclear and cell divisions. I. Observations with living cells of the effects of neutral salts and heavy metal salts.
Cytologia, Tokyo 1944 : **13** : 380–404.

In solutions of alkali metal salts at high concentrations, leaf and petal cells of *Tradescantia reflexa* are plasmolysed and chromosomes become a homogeneous mass. Deplasmolysis occurs in water and the chromosomes undergo reconstruction to form binucleate cells or tetraploid nuclei. In medium concentrations plasmolysis does not occur but vacuoles in the cytoplasm become swollen, cytoplasmic streaming ceases and the cytoplasmic strands increase in refractivity and decrease in number; the chromosomes become refractive and clump together in a mass which decreases in size. Nuclear reconstruction will occur in water, but less readily than after plasmolysis, with the formation of binucleate cells or tetraploid nuclei. These observations show that there is no apparent essential difference between the effects of alkali metal salts and alkaloids, narcotics and neutral salts; the application of alkali metal salts to induce abnormal division would be limited, practically, by the narrow range of effective concentrations.

1574. Sigenaga, M.
Experimental studies of abnormal nuclear and cell divisions. II. Observation with living cells of the effects of alkalis and acids.
Cytologia, Tokyo 1945 : **14** : 34–54.

Alkalis and acids of certain concentrations have been used to induce the formation of tetraploid nuclei and binucleate cells. The process in each case is similar, consisting of dehydration of the spindle or phragmoplast and chromosomes and, on replacement of the medium with water, nuclear reconstruction. Alkaline solutions of high concentrations directly affect the chromosomes by causing swelling and clumping together; acids coagulate the whole protoplast immediately. Acids, strong alkalis and heavy metal salts all have narrow ranges of effective concentration and time of immersion.

1575. Loveless, A.
Qualitative aspects of the chemistry and biology of radiomimetic (mutagenic) substances.
Nature, Lond. 1951 : **167** : 338–42.

A wide range of monofunctional and polyfunctional alkylating and esterifying agents have been tested at the Chester Beatty Research Institute, London, for their radiomimetic effect, i.e. capacity to induce chromosome breakage and rearrangements. Root tips of *Vicia Faba* formed the material used for most of the tests. The only compounds found to have a radiomimetic capacity were those capable of reacting by a carbonium ion mechanism; the significant reaction resulting in radiomimetic activity is probably an esterification of ionized acids. The radiomimetic activity of organic peroxides is also reported.

It is suggested that certain mutagens, e.g. formaldehyde, may act through the intermediate formation of organic peroxides by reaction with naturally produced hydrogen peroxide, and that the activity of organic peroxides lies in their ability to liberate alkyl rather than hydroxyl radicals.

1576. Darlington, C. D. and McLeish, J.
Action of maleic hydrazide on the cell.
Nature, Lond. 1951 : **167** : 407–08.

Treatment of root tip cells of *Vicia Faba* with 0·0001 M solutions of maleic hydrazide (1,2-dihydropyridazine-3,6-dione) for 1–24 hours resulted in breakage of chromosomes. Breakage was confined to the heterochromatin, in contrast to breakage caused by X-irradiation in which only the euchromatin is affected.

1577. Lewitsky, G. A.
A cytological study of the progeny of X-rayed *Crepis capillaris* Wallr.
Cytologia, Tokyo 1940 : **11** : 1–29.

An account is given of abnormalities induced by X-irradiation in *C. capillaris*, including translocations, inversions, duplications of whole chromosomes and parts of chromosome D, and decreased fertility in structural aberrants. The correspondence between racial and specific differences in chromosome structure on the one hand and experimentally induced hereditary chromosomal rearrangements on the other is regarded as indicative of the evolutionary significance of such cytological changes.

1578. Kimura, M.
The theory of the chromosome substitution between two different species.
Cytologia, Tokyo 1950 : **15** : 281–94.

Tables and graphs are presented, indicating the rate of chromosome substitution between two different species under various conditions. The chromosome substitution is accomplished by Kihara's second method in which the F_1 individuals are back-crossed to the male parent, producing a hybrid which is again back-crossed to the same plant; this technique is repeated for a number of generations, during which the cytoplasmic effect on the phenotypic expression of the gene can be detected.

1579. Levitan, M.
Heterosis in populations with a pericentric inversion.
Va J. Sci. 1950 : **1** : p. 352. (Abst.).

The rarity of pericentric inversions in nature is thought to be due to the selective disadvantage of inferior fertility caused by crossing-over within the inversion. Two pericentric inversions have been found in *Drosophila robusta*; rapid directional changes by natural selection have been observed; in some of these the frequency of 2L–3 decreases, while in others it increases. Equilibria are formed between 2L–3 and other arrangements, 2L or 2L–1, indicating that the adaptive superiority of the heterozygotes for these arrangements is responsible for retaining the pericentric inversion.

1580. Fujii, S.
Further studies on the salivary gland chromosomes of *Drosophila virilis*.
Cytologia, Tokyo 1942 : **12** : 435–59.

Genetical and cytological studies on translocations and inversions in *D. virilis* have led to the following conclusions: (1) the chromocentral region is not a mere aggregate of the

proximal ends of the chromosomes but is composed of α-heterochromatin; (2) β-heterochromatin exists at the proximal ends of most chromosomes; (3) α-heterochromatin forms the inert regions of mitotic chromosomes in addition to β-chromatin localized in the active genes; (4) the nucleolus is not connected with β-heterochromatin in the X-chromosome but is attached to the α-heterochromatin by a bundle of spiral threads; (5) the morphologically "weak" points of the euchromatic region appear to have no genetical significance; and (6) the apparent fusion of the distal ends of some chromosomes is merely a random aggregation.

1581. MARQUARDT, H.
Über Bau, Häufigkeit und Auswirkungen der spontanen Translokationen.
(On the structure, frequency and effects of spontaneous translocations).
Flora, Jena 1941 : **35** : 239–302.

In this critical review the following aspects of the subject are discussed in detail: somatic translocation, including the types that occur and the effects of translocation in somatic tissue and in meiosis; translocations during meiosis with reference to ring formation; the relative roles of somatic and meiotic translocation; and spontaneous translocation and the problem of the constancy of chromosome form.

1582. HAGA, T.
A reciprocal translocation in *Lilium Hansonii* Leicht.
Cytologia, Tokyo 1943 : **13** : 19–25.

Observations were made on a plant which was heterozygous for a reciprocal translocation. At metaphase pairing, the four chromosomes assumed a ring configuration, modified by a number of interstitial chiasmata. Kinetochores of homologous segments maintained their prophase synapsis up to the first metaphase. At the first anaphase two types of chromatid bridges were formed, viz. those accompanying akinetic fragments and those not accompanying them; the latter type were interpreted as half-twists around spiralized sister chromonemata. The high percentage of pollen abortion is probably caused by orientation of a pair of synapsed kinetochores, in the ring of four chromosomes, along the spindle axis at metaphase; during consequent repulsion two adjacent chromosomes pass to the same pole and unbalanced gametes are formed.

1583. SPARROW, A. H. and
POND, V.
Supernumerary chromosomes in diploid and triploid *Trillium erectum* L.
Genetics 1950 : **35** : p. 694. (Abst.).

Out of 237 diploid and 3 triploid plants 19% had one or more supernumerary or fragment chromosomes at first meiotic metaphase. Irregular distribution of the supernumerary chromosomes occurred during meiosis, followed by some loss due to lagging; hence their number in microspore nuclei was highly variable. The high percentage of plants with supernumeraries suggests that such chromosomes may have a positive selective value, or at least have no serious deleterious effect. Since these supernumerary chromosomes are small they may sometimes be confused with radiation induced fragments; in investigations on the effects of radiation this risk can be eliminated by proper screening of the material before or during an experiment.

1584. KIHARA, H.
(The future for investigations on polyploidy).
Bot. and Zool. 1939 : **7** : 2037–38. [Japanese].

Promising lines of research, both from the theoretical and practical point of view, are indicated.

1585. CHIARUGI, A.
La poliploidia della generazione aploide femminile delle fanerogame. (**Polyploidy in the haploid female generation of flowering plants**).
Caryologia, Pisa 1950–51 : **3** : 149–55.

In the writer's opinion special consideration should be given to polyploidization in any study of embryo sac and endosperm development in the angiosperms from the standpoint of their evolutionary history.

1586. D'AMATO, F.
Differenziazione istologica per endopoliploidia nelle radici di alcune monocotiledoni. (**Histological differentiation by endopolyploidy in the roots of some monocotyledons**).
Caryologia, Pisa 1950–51 : **3** : 11–26.

Observation of the effects of solutions of sodium 2,4 dichlorophenoxyacetate on root tissue in *Allium sativum, Bellevalia romana, Muscari comosum, Hyacinthus amethystinus, Crinum Makoyanum* and *C. longifolium* has shown that endopolyploidy, i.e. the production of **4*n*** mitoses in the course of tissue differentiation, occurs in all the above species except the two *Crinum* species. The chromosome behaviour in the four species is described; diplochromosomes due to division in the resting nucleus occurred in all cases, with the first centromere division occurring at metaphase in *Allium* and at the onset of prophase in the other three species.
The problem of true endomitosis is touched upon with reference to Lima de Faria's work on the function of the centromere (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 758).

1587. SCHWANITZ, F. and
SCHWANITZ, H.
Untersuchungen an polyploiden Pflanzen. X. Weitere Beiträge zur Sexualität polyploider Pflanzen. (**Investigations on polyploid plants. X. Further contributions on the sexuality of polyploid plants**).
Züchter 1950 : **20** : 336–46.

The investigations were made to adduce further proof of the author's theory that the fundamental cause of reduced sexuality in polyploids is the increase in cell size with concomitant morphological and physiological changes and decrease in the ratio of cell surface to cell volume.
Comparative studies of diploid and polyploid, i.e. tetraploid and in some cases octoploid, plants using *Papaver nudicaule* and *Aquilegia Skinneri*, showed a decrease in the number of anthers in the tetraploid and octoploid. In the case of *Raphanus sativus* var. *major, Dianthus superbus, Eschscholtzia californica, Verbascum thapsiforme, Digitalis ferruginea, Datura Stramonium* and *D. inermis*, the polyploids showed a decrease in the number of pollen grains per anther. In *Brassica campestris, R. sativus, Fragaria vesca, E. californica, Malva sylvestris* var. *Mauretiana, V. thapsiforme, Linaria maroccana* and *L. vulgaris* various increased percentages of malformed pollen were found in the tetraploids.
In the Michaelmas daisy the number of malformed and green flowers was considerable, as is often so, even in the diploid, but the tetraploid, and especially the octoploid forms, showed a notable increase in malformed flowers and the number of green flowers was also higher in the tetraploid.
In *Dianthus barbatus, Allium Schoenoprasum, Digitalis purpurea, Salvia sclarea* and *Melissa officinalis* the percentage of tillers in the tetraploids was about half that in the diploids and in the *Dianthus barbatus* tetraploid the percentage of tillers which shot was less than in the diploid; in *A. Schoenoprasum* no difference in shooting was found between the two forms, though tillering was lower in the tetraploid than in the diploid. This exceptional result is explained as due to the fact that in the tetraploid, owing to the

structure of this plant, more nutrients are available so that the effect of retardation of the supply of nutrients is neutralized.
In all the above cases the changes indicating lowered sexuality in the polyploids are referred to inferior transport of nutrients caused by increase in the cell size.

1588. Oka, H.
(Chromosome doubling by the decapitation-callus method).
Bot. and Zool. 1939 : **7** : 957–66. [Japanese].

A comprehensive review is given of work done on the induction of polyploidy by the decapitation method.

1589. Shimamura, T.
(The effect of lycorin on nuclear division).
Bot. and Zool. 1939 : **7** : 797–99. [Japanese].

C-mitotic effects have been observed by applying lycorin solutions to root tips. The observations are compared with those made after colchicine treatment.

1590. Shimamura, T.
(Irregular nuclear division induced by acenaphthene).
Jap. J. Genet. 1942 : **18** : p. 92. [Japanese].

A description is given of the mitotic aberrations, in particular multinucleate cells and alterations in chromosome number, induced by treatment with acenaphthene.

1591. Nishiyama, I.,
Furusato, K.,
Motizuki, A. and
Yasumoto, T.
(Studies on artificial polyploid plants. II. The effect of colchicine on germinating seeds).
Bot. and Zool. 1939 : **7** : 1241–46. [Japanese].

Seeds of 20 species of plants were immersed in 0·02–0·8% aqueous solutions of colchicine for 24–94 hours at 24° C. Some survived and produced tetraploids and, in the case of *Petunia*, octoploids.

1592. Noguchi, Y.
(Colchicine induced polyploidy and its applications).
Bot. and Zool. 1941 : **9** : 455–66. [Japanese].

A general review is presented of the mode of action of colchicine, and of the ways in which it may be used in practical breeding.

1593. Eigsti, O. J.
Colchicine and related compounds compared for C-mitotic activity.
Genetics 1950 : **35** : p. 662. (Abst.).

A study was made of the toxic and c-mitotic effect of colchicine and related new compounds, using the technique of pollen tube culture. In general the compounds showed greater toxicity and less c-mitotic activity than colchicine. Trimethylcolchicinic acid methyl ether d-tartrate exerted more c-mitotic effect than any other new compound; the differences between the effects of colchicine and the above substance were only slight.

1594. Reese, G.
Beiträge zur Wirkung des Colchicins bei der Samenbehandlung. (**Contributions to the study of the effect of colchicine on seeds**).
Planta 1950 : **38** : 324–76.

A detailed account is given of the morphological, physiological, developmental and histological changes caused by colchicine when applied to the seeds of *Lepidium sativum* and *Petroselinum crispum*. Special attention was devoted to the development of the stomata.

1595. Suita, N. and
Soyano, Y.
(**The technique of applying acenaphthene**).
Bot. and Zool. 1939 : **7** : 799–800. [Japanese].

The different ways in which acenaphthene may be used to induce polyploidy are briefly recounted.

1596. Miyabayashi, T.
(**Investigations on colchicine induced polyploidy**).
Bot. and Zool. 1941 : **9** : 251–62, 413–23*. [Japanese].

A comprehensive review is given of the techniques of colchicine application that have proved successful with different plants. The various effects produced by colchicine and its mode of action are also surveyed. Tables are given of the species subjected to the various techniques.

1597. Schwanitz, F.
Untersuchungen an polyploiden Pflanzen. II. Zur Keimungsphysiologie diploider und autotetraploider Nutzpflanzen. (**Investigations on polyploid plants. II. On the physiology of germination of diploid and autotetraploid economic plants**).
Planta 1949 : **36** : 389–401.

In continuation of previous work (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 1676) diploid and tetraploid *Raphanus sativus*, *Brassica Rapa* var. *oleifera* and *Sinapis alba* were compared as regards (*a*) rate of germination, (*b*) the force with which the seedling penetrates the soil, and (*c*) resistance to various injurious chemical substances.
In test (*a*) after the first 12 hours, the diploids proved superior to the tetraploids in rate of germination and of water intake, probably owing to more active respiration. In test (*b*), in which *Lepidium sativum* was also included, the tetraploids were superior to the diploids owing to their greater 1000 seed weight. In test (*c*), the tetraploids were inferior not only in resistance to injurious chemicals but also to deficiency of soil nutrients.

1598. Satina, S.
Preferential functioning of 2*n* pollen grains in certain species of *Datura*.
Amer. J. Bot. 1950 : **37** : 666–67. (Abst.).

In a race of *D. meteloides* and in a race of *D. Metel* a high proportion of 2*n* pollen occurs. Only triploids have been obtained by using pollen of these two races, consisting of a mixture of 2*n* and *n* grains, in crosses with *D. Stramonium*. From selfs or compatible crosses only diploids have arisen. The triploids resemble the male parents phenotypically, a fact indicating that the extra set of chromosomes originated from the 2*n* pollen grains. The results are contrary to those obtained with *D. Stramonium*, in which species the cross 2*n* x 4*n* fails because the 2*n* pollen tubes burst and the triploid progeny of the cross 4*n* x 2*n* usually abort.

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* Pp. 251–54 are erroneously numbered in the original as Pp. 267–70 respectively.

1599. Schwanitz, F.
Untersuchungen an polyploiden Pflanzen. XI. Zum Chlorophyllgehalt diploider und polyploider Pflanzen. (**Investigations on polyploid plants. XI. On the chlorophyll content of diploid and polyploid plants**).
Züchter 1951 : **21** : 30–36.

Analysis of the pigment content of the leaves of diploid and polyploid races and species, using Egle and Seybold's chromatographic method, showed that the amount and composition of leaf pigments are unaltered by polyploidy. The large number of economic plants studied included vegetables and wheats.

1600. Fukushima, E.
(**Induction of polyploidy in pollen grains by treatment with acenaphthene**).
Bot. and Zool. 1939 : **7** : 953–56. [Japanese].

The technique for inducing polyploidy in pollen by means of acenaphthene is described, based on the work of Kostoff and Nebel (cf. *Plant Breeding Abstracts*, Vol. IX, Abst. 61).

1601. Modilevsjkiĭ, Ja. S.
(**Present knowledge of the fertilization processes in angiospermous plants**).
Bot. Ž. (Bot. J.), Kiïv 1949 : **6** : No. **3** : 3–18. [Ukrainian].

The discoveries made by Gorožankin, Navašin, Mičurin and Lysenko are regarded as the principal landmarks in the history of the study of the subject since Darwin.
Lysenko's role lies in the materialist interpretation of the effect of metabolism upon heritable properties of organisms and Mičurin's in the discovery of selective fertilization and mentors.

1602. Ellengorn, Ja. E. and
Svetozarova, V. V.
(**The process of fertilization in angiospermous plants**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) Ser. Biol. 1950 : No. **3** : 20–42. [Russian].

Fertilization processes in angiosperms are discussed in the light of the latest Mičurinite research and experiments with *Amaryllis* and *Tulipa* spp. conducted at the Central Botanical Garden of the USSR Academy of Sciences.
Much of the new Soviet evidence indicates that the fertilization processes cannot be explained simply by the fusion of the male gametes with the egg cell nucleus and the polar nuclei.
In the experiments with *Amaryllis*, the male sex cells penetrated to the somatic cells of the ovules. This is taken to prove that the mutual assimilative processes between the male and female elements are not limited to processes inside the embryo sac but also involve tissues which surround the embryo sac. Until now embryologists when studying fertilization processes have concentrated all their attention on the type of structure and the development of the embryo sac. The role of the so-called surplus pollen which reaches the egg cell plasma was disregarded. These surplus pollen grains carry proteins which are different from the egg cell proteins and may cause changes in the egg cell plasma. The future development of the egg cell will to a great extent depend on the quantity of pollen reaching it. The members of each pair of male gametes differ from each other in their electric charge. The same differences in respect of electric charges exist also between individual pairs of male gametes. As a result of the fertilization of egg cells having different properties by male gametes with different properties, zygotes with different properties may arise. In *Tulipa*, the male generative cells secrete plasma into the embryo sac, the male plasma having different pH and isoelectric point from that of the plasma of the embryo sac.

Both the nucellar nuclei and the haploid nuclei of the embryo sac have a high negative charge, namely −240 mV. The male generative cells and nuclei have a lower negative charge of −90 mV.
The nuclei of the nucellar cells are bipolar both regarding their isoelectric point and the extent of ionization at the poles. The male nuclei are always located near those poles of the nuclei of the nucellar cells which have the lower pH and isoelectric point. The direct contact between the male nuclei and the nuclei of the nucellar cells occurs at the point with the lowest negative charge.
In addition to the nucellar cells, the pericarp cells are also fertilized, especially the placental cells. There is a difference between the fertilization of the egg and that of the placental cells. In the former, the plasma of the generative cells flows into the embryo sac and the somatic cells of the ovule fuse with the sex nucleus and its plasmatic organoids. In the latter instance, the whole sex cell is added to the somatic cells of the ovary.

1603. Lebedev, S. I.
(Carotenoids in the reproductive organs of plants and their role in fertilization).
Bot. Ž. (Bot. J.), Kiïv **1949** : **6** : No. **3** : 19–33. [Ukrainian].

The results of Ukrainian experiments with material including a wide range of economic plants are reported.
In the pollen grains of entomophilous plants the carotenoids are found in a free extraplastic state in the lipoid deposits of the exine, while in the pollen of anemophilous plants they are attached to the proteins of the pollen cell.
Study of the yellow pigments in the reproductive organs of various plants demonstrated a downward flow of the yellow pollen pigments in fertilization; the penetration of the stigmatic tissue and the style by the pigments is the opening phase of the metabolic exchanges between the male and female reproductive elements in fertilization. The yellow pollen grain pigments stimulate the development of the stylar tissues and intensify the growth of the pollen tubes.
The direct contact between the andrecium and the receptacle, which contains appreciable amounts of carotene, shows that vegetative and sexual cells are closely associated in their mutual interactions upon each other.
The phenomenon of fertilization is regarded as a physiological process based upon metabolic interaction between the pollen grains and the gynecium.

1604. Yasuda, S.
(Sex reversal in higher plants).
Bot. and Zool. **1939** : **7** : 1073–81. [Japanese].

A review is given of the literature on sex reversal in angiosperms.

1605. Knapp, E.
Bemerkungen zu Geschlechtsbestimmungsfragen. **(Observations on sex determination problems).**
Flora, Jena **1943** : **37** : 139–51.

In this critical discussion on the genetic basis of sex determination, prominence is given to the work of Correns with reference to the problems of the mechanism underlying sex determination, the nature and role of realizers, and the proper nomenclature of the subject.

1606. Bowen, C. C. and
Wilson, G. B.
Some factors correlated with differential reactivity in the somatic chromosomes of *Trillium*.
Genetics **1950** : **35** : p. 656. (Abst.).

A series of Feulgen squash preparations of root tips of *T. sessile*, treated for 24 to 120 hours at 2° C., was subjected to quantitative study. The apparent degree of differential

reactivity was in inverse proportion to the degree of contraction shown by the undifferentiated portions of metaphase chromosomes. This degree of differentiation, however, was found to vary directly according to the duration of cold treatment and the relative frequency of division figures.

*BOTANY

1607. Kružilin, A. S. and
Švedskaja, Z. M.
(The individual role of leaves in phasic development).
Agrobiologija (Agrobiology) 1950 : No. 5 : 80–93. [Russian].

Several errors in Krenke's theory of cyclic senescence and rejuvenation of plants (cf. *Plant Breeding Abstracts*, Vol. XV, p. 181) are pointed out.
The principal error of Krenke was to explain the cyclic processes of senescence by automatic internal causes without consideration of external conditions. Experiments conducted at the Moscow Scientific Research Institute of Vegetable Farming suggest that the processes of senescence in plants are related to their phasic development which is closely associated with temperature, light and other external conditions.

1608. Tallarico, G.
Luce Mediterranea. **(Mediterranean light).**
Humus, Milan 1950 : **6** : No. **7** : **3–5.**

In further demonstration of the author's theory of the antithesis between the effects of northern and southern climates on plant development (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2197) he claims to show that the Mediterranean basin provides the ideal environment for the processes of seed formation. Extra-dormancy, high embryonic index of seed, and the advantages of "meridionalization" of seed of northern provenance and for sowing in northern latitudes are discussed, and in conclusion Italy's claims to become the seed nursery of Europe are mentioned.

1609. Kuhnholtz-Lordat, G.
L'affinité des géniteurs. **(The affinity of parents).**
Bull. Techn. Inform. Ingén. Serv. Agric. 1950 : No. **54** : 685–86.

The French farmer is provided with a detailed, popular description of the various stages in plant fertilization and of the way in which factors other than actual union of the gametes, e.g. hormone action, may affect the outcome of conjugation. Heterosis and degeneration due to inbreeding are also explained.

1610. Aleksandrov, V. G.
(The problem of the origin of chloroplasts in plant cells).
Bot. Ž. (Bot. J.), Moskva 1950 : **35** : 475–81. [Russian].

Results of cytological investigations in Leningrad on grains of wheat originating from Asia are reported. During the study of the second layer of the so-called transverse cells, found in the inner layer of the mesocarp parenchyma, formation of chloroplasts was observed. The cells in which the chloroplasts developed contained fine granules showing the characteristic starch reaction in iodine tests. It is considered that the chloroplasts arose from substances contained in the cells and not as a result of divisions of any original plastids inherited from the female parent plant. The evidence obtained is regarded as contradicting Schimper's theory on the individuality of plastids.

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* General studies, see also individual crops.

1611. Gascoigne, R. M.,
Ritchie, E. and
White, D. E.
A survey of anthocyanins in the Australian flora.
J. Roy. Soc. N.S.W. 1948 : **82** : 44–70.

Compared with previous surveys the results of a survey of anthocyanidins in the flowers of some 300 native Australian species show differences in the distribution of pelargonidin, cyanidin and delphinidin, the frequency of methylation of these anthocyanidins and the distribution of glycoside types; these differences are tentatively ascribed to the presence of mutant forms. Mutation, together with artificial selection, may increase the occurrence of pelargonidin and cyanidin at the expense of delphinidin and also the occurrence of diglycosides at the expense of monoglycosides. The same factors appear to increase the frequency of methylation.

1612. Horn, D. L. Van and
Domingo, W. E.
Comparison of seed and vegetative propagation methods for red squill.
Econ. Bot. 1950 : **4** : 350–53.

Seed propagation of red squill (*Urginea maritima*) used for producing raticides caused a very much greater increase of a given weight of parental bulb material during a five-year period than vegetative methods. Assuming that toxicity is largely determined by hereditary factors, propagation by seed would be the more desirable method of multiplication, provided that lines can be developed possessing homozygosity for the factors controlling toxicity and growth (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 1454).

1613. Boguslawski, E. von.
Zur Auswertung von Sortenversuchen und ähnlichen Versuchsfragen.
(On the evaluation of variety trials and similar problems).
Z. Acker- u. Pflanzenbau 1950 : **92** : 397–415.

In field experiments random and systematic errors are always present; moreover, statistical methods of calculation are used even in cases where the number of replications is low. At the present time different and sometimes simplified formulae are used for the estimation of error and so correspondingly different limits of error must be considered in evaluating the statistical probability of results. In this connexion the author suggests that a conference to discuss standardization of methods of determining error is desirable.
The unsatisfactory nature of the results obtained by merely arranging the varieties in a sequence according to yield and calculating the percentage mean deviation, is shown in the case of a series of trials made with winter wheat in four districts. The proper procedure for evaluating variety trials by determining the differences in the varieties, whilst taking into account the statistical probability of each of the experimental results, is described. The mean of the absolute field values found for the varieties is shown to be the best standard for reference. The simplifications permissible in formulae are discussed. The way is demonstrated in which varieties should be grouped into five yield classes based on the statistical probability of the results for the yield differences. In an example of trials of flax strains the author shows that, after simplification of the standard procedure for laying out the trials, in addition to evaluation of the relative yields, the five class system of grading may be properly applied; these classes may then be plotted in graphs for rapid survey in evaluating breeding material.
The author's method involving more accurate estimation of error is especially useful in testing strains and varieties for breeding, in which differences are often very slight.

1614. VERVELDE, G. J.
Kweken op resistentie of op opbrengst. . . . (**Breeding for resistance or breeding for yield**).
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) 4 March, 1948 Wageningen : 216–18. (Mimeographed).

In this discussion on Mastenbroek's lecture "Which takes precedence, breeding for resistance or yield?" the suggestion was put forward that most breeders, possibly unwillingly, select for the most easily distinguished character. In a fairly new crop yield will show outstanding differences, but as higher levels are reached differences are not so easily seen. The following question was also posed: if, where a testing system is followed and the field experimental system has a standard deviation α, and amongst a large number of varieties one occurs with a yield potential $\alpha\,\sigma$ standing out above the others (for this purpose considered individually to be of equal value), then what is the chance that this variety will be still retained after 1, 2 or 3 years, if the selection principle is that $a\%$ of the best yielding varieties are retained? Tables are given showing (1) the probability for $\alpha = 1$ and $\alpha = \frac{1}{2}$, for 1, 2, 3 and 4 replications; and (2) the odds for excess yield of the superior variety $= \frac{1}{2}\,\sigma$ with 3 replications, after 0 to 3 years when $a = 5\%$ and $a = 10\%$.

1615. MUNN, M. T. (Editor)
Proceedings of the Association of Official Seed Analysts Fortieth Annual Meeting, Washington D.C. May 4-8, 1950 : Pp. 122.

In addition to the reports of the committees on various aspects of seed analysis in the United States and Canada, the following contributions are included: Variety determinations of Sudan grass seed, by F. L. Wertman and O. L. Justice, describing experiments on the glume colour of progeny of common and Sweet Sudan grass; Some brief notes on the identification of seeds of foxtail millet, *Setaria italica*, by A. F. Musil; Studies in the varietal determination of German and common millet, by B. B. Jackson; Seeds of *Agropyron*, eleven species of economic interest compared, by A. F. Musil; and How many plants should a trueness-to-type-trial contain, by B. E. Clark.

*DISEASES, INJURIES, BACTERIA, FUNGI, VIRUSES

1616. RUBIN, B. A.
The nature of streptomycin requirement and its effect on the genetics of streptomycin resistance in *E. coli*.
Genetics 1950 : **35** : 687–88. (Abst.).

The existence of several types of streptomycin resistant mutants of *Escherichia coli* provides a means of studying bacterial populations. The occurrence of mutants follows a Poisson distribution so closely that a simple method for indicating the distribution is possible. By this means, not only mutation rates but the distribution of types could be estimated with predictable error. A stabilized frequency of mutants in populations was reached which could not be accounted for by growth rates alone. Much higher stable levels and different distributions were attained after exposure to radiation. Apparent variations in mutation rates depending upon changes in the medium, including the level of streptomycin, could be related to the various effects of the constituents upon the metabolism of the streptomycin sensitive, resistant and dependent types. Although the concentration of streptomycin in the medium was an important factor influencing variation in mutation rate, none of the genetic types detectably affected the concentration of the drug.

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* General studies, see also individual crops.

1617. Braun, W.,
Goodlow, R. and
Kraft, M.
The role of metabolites in bacterial variation.
Genetics 1950 : **35** : p. 656. (Abst.).

Application of paper partition chromatography to studies on population changes in broth cultures of *Brucella* spp. has shown that the concentration of alanine, accumulating as an end product of the normal metabolism of the cell, determines which antigenic and colony type mutant may establish itself at different times during the growth of a mixed culture. These mutants differ in susceptibility to the toxic effects of alanine; continuous population changes in the presence of increasing metabolite concentrations are thus due to the progressive establishment of mutants with increasing resistance to alanine; since quantitative differences in alanine production by different mutant types occur, the initial proportion of a given mutant in a mixed inoculum determines the ability of the mutant to establish itself during the growth of the culture.

1618. Newcombe, H. B. and
Nyholm, M. H.
The inheritance of streptomycin resistance and dependence in crosses of *Escherichia coli*.
Genetics 1950 : **35** : 603–11.

The results of investigations on crosses of streptomycin sensitive lines (*ss*) with the mutants *sr*, *sd*, *sd*/*ss* and *sd*/*sr* are reported. The mutants *sr* and *sd*, streptomycin resistant and dependent, respectively, were induced by ultraviolet radiation. The two-step mutants were obtained by spreading irradiated suspensions of the form *sd* on the surface of nutrient agar in the absence of streptomycin and incubating at 37° C. Cultures from the colonies thus produced were classed by streaking in duplicate on nutrient agar in the absence and presence of streptomycin. When growth occurred only in the absence of the drug the culture was termed *sd*/*ss*; when it was observed on both plates the culture was designated *sd*/*sr*; but this classification was arbitrary since the mutants exhibited a more or less continuous range with regard to degree of streptomycin resistance. The results indicated that a single locus conditions response to streptomycin; this locus can apparently mutate to a number of different categories of alleles and each category may contain a range of mutant types. Of four double mutants derived from *sd*, two sensitive ones (*sd*/*ss*) and one resistant (*sd*/*sr*) behaved, upon crossing, as if both mutations had occurred at the same locus; the remaining mutant behaved as if the second of the two changes had been the result of mutation at a modifier locus. Linkage was observed between *sr* and capacity to ferment galactose, arabinose, xylose and maltose; the data did not however imply linear arrangement of the genes concerned.

1619. Barer, G. R.
The action of streptomycin on *Bacterium lactis aerogenes*.
J. Gen. Microbiol. 1951 : **5** : 1–17.

Experiments on the action of streptomycin upon *B. lactis aerogenes* and the manner in which resistance to the drug develops are reported and the results analysed in the light of the alternative hypotheses of mutation and adaptation. The data suggest that adaptation of the bacteria to growth in a given concentration of streptomycin involves the selection of those cells able to survive in that concentration. If the surviving cells owe their resistance to mutations which occur spontaneously before contact with streptomycin, the existence of many mutant types must be postulated to explain the many degrees of resistance. From their rapid growth in streptomycin some cells appear to be completely adapted from the start; most cells, however, grow slowly or after a delay, suggesting the possibility that further adaptation is occurring. The following alternative is suggested to the mutation hypothesis. Surviving cells may possess an extreme degree of some variable property or continuous variation depending upon a polygenic system, rather than mutation; and direct modification of the protoplasm of survivors may take place in the

presence of streptomycin. If such modification involved a change in the enzyme balance of the cells which afforded no disadvantage in normal media, it might be copied indefinitely. The variation may represent an alteration in the degree of manifestation of certain genes. It is however emphasized that resistance to streptomycin has not been proved to be wholly due to mutation or to adaptation. One fact particularly difficult to explain on the basis of the mutation hypothesis is the occurrence of large numbers of non-resistant cells found in colonies on high concentration streptomycin plates; their growth is possibly due to overcrowding and so-called assistance effects. "Mutants" may simply represent the tail of the distribution curve for ability to synthesize an essential metabolite or of the property enabling them to resist an antibiotic; this would explain why so-called mutants only appear in cultures which have reached a certain population size; in the present work it was demonstrated that the highest concentration of streptomycin permitting growth increased steadily with population size in a growing culture. The statistical method of analysis developed by Luria and Delbrück is criticized on the grounds that all causes of variability other than mutation have not been eliminated. It is pointed out that for support of the adaptation theory it must be proved that every surviving cell undergoes a process of adaptation; an attempt was made to investigate this aspect but the results were inconclusive; difficulties of devising methods of studying this problem are discussed. Possibly either theory is valid at times, and in some cases both may be a true interpretation. The two theories may also be less distinct than is apparent; induction of mutation by a specific stimulus may be regarded as only a special case of the adaptation theory, i.e. as the adaptation of a specific part of the cell; enzymatic increase may represent the manifestation of a gene which could not be expressed under wild conditions; the correspondence found between training concentration of streptomycin and resistance could be explained on this basis. Finally, it is emphasized that the inheritance of acquired characters in bacteria need not be condemned as Lamarckian since in bacteria every cell is a germ cell and directly exposed to variable conditions.

1620. Bryson, V.
Photo-stimulation of *E. coli* mutants resistant to streptomycin.
Genetics 1950 : **35** : 657–58. (Abst.).

Streptomycin resistant mutants of *Escherichia coli* that were not induced by ultraviolet irradiation but were merely due to increased viability, resulting from the direct photostimulation of the ultraviolet treatment, have been recognized. The emergence of these mutants suggests that the usual experiments on mutagenic agents may involve factors such as modified selective pressures of the experimental environment or modified growth potentials of variants that are relatively inviable in the untreated population.

1621. Umbarger, H. E. and
Mueller, J. H.
Isoleucine and valine metabolism of *Escherichia coli*. I. Growth studies on amino acid-deficient mutants.
J. Biol. Chem. 1951 : **189** : 277–85.

Two biochemically deficient mutant strains of *Escherichia coli*, 11A16 and 20A19, were obtained from strain K–12 by ultraviolet irradiation. Both were deficient in their capacity to synthesize isoleucine; 20A19 was also unable to synthesize valine. Evidence of a genetical block in the conversion of α-keto-β-methyl-n-valeric acid to isoleucine in strain 11A16 has been obtained from tube cultures. Accumulation of α-keto-β-methyl-n-valeric acid in culture prevents the formation of valine from α-ketoisovaleric acid.

1622. Gibson, M. L. and
Gibson, F.
Development of resistance to dihydrostreptomycin by *Bacterium coli*.
Nature, Lond. 1951 : **167** : 113–14.

Data were obtained suggesting that both adaptation and mutation are involved in the development of increased resistance to dihydrostreptomycin. With regard to the latter

process, a high level of resistance developed from a very low level in a single step, indicating the occurrence of a single mutation; the results favour the view that the mutation was induced by the drug.

1623. WITKIN, E. M.
The use of sodium nucleate in the study of the mutagenic activity of acriflavine in *Escherichia coli*.
Proc. Nat. Acad. Sci., Wash. 1950 : **36** : 724–31.

Sodium ribonucleate was used to bring the exposure of bacteria to acriflavine to a sharp end point, to eliminate residual activity of this substance in the subsequent handling of the treated bacteria, and to prevent agglutination. As in previous experiments (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 2055), acriflavine induced mutations from phage sensitivity to phage resistance in strain B/r of *E. coli*. An acriflavine resistant strain, derived from B/r, required 30 times as much acriflavine as did B/r to show a comparable mutagenic effect and level of survival.

1624. UMBARGER, H. E. and MAGASANIK, B.
Isoleucine and valine metabolism of *Escherichia coli*. II. The accumulation of keto acids.
J. Biol. Chem. 1951 : **189** : 287–92.

Syntrophism observed between mutant strains 11A16 and 20A19 of *Escherichia coli* (cf. Abst. 1621) on minimal agar culture plates is made possible by (1) the accumulation of keto acids by strain 11A16, which support the growth of the isoleucine and valine deficient mutant 20A19, and (2) a conversion of excess α-keto-β-methyl-n-valeric acid to isoleucine by strain 20A19 which allows the continuous growth of strain 11A16.

1625. NEWCOMBE, H. B.
Photoreversal of the mutagenic effect of ultraviolet light in *E. coli*.
Genetics 1950 : **35** : p. 682. (Abst.).

The mutagenic action of short (2537 Å) ultraviolet radiation upon *Escherichia coli* can be partially reversed by posttreatment with long (3650 Å) ultraviolet rays. This reversal is most striking when the original dose is small (up to about 500 ergs per mm.^{2}), about 95% of the potential mutants failing to appear. When the original dose is higher two effects are noted: (1) the yield of mutants produced by short ultraviolet radiation alone ceases to rise with increasing dose and in some cases actually declines; and (2) the mutagenic effect is less reversible by posttreatment with long ultraviolet radiation, only 20 to 30% of the potential mutants failing to appear. The mutagenic effect of γ rays has a similar stability to that produced by high doses of short ultraviolet radiation.

1626. MARSHAK, A.
Structures in *E. coli* resembling chromonemata.
Proc. Nat. Acad. Sci., Wash. 1951 : **37** : 38–41.

Morphological and chemical evidence of chromonemata in *Escherichia coli* has been obtained.

1627. RAVIN, A. W.
Genetic and non-genetic variability in citrate utilization by *Aerobacter aerogenes*.
Genetics 1950 : **35** : p. 687. (Abst.).

Cultures of *Ae. aerogenes* grown in synthetic glucose medium under specific conditions showed a non-genetic heterogeneity with respect to the utilization of citrate as the sole

source of carbon for growth. By using cultures free from this heterogeneity and the penicillin technique for screening biochemically deficient mutants, mutants which do not utilize citrate were obtained. The mutants arose spontaneously with a frequency of about 10^{-5} in synthetic glucose medium. They were extremely stable and no reversions to citrate utilization were detected. The mutants also differed from the citrate utilizing parents in their lower final level of growth in nutrient broth and their ability to utilize succinate, fumarate, acetate, glutamate and aspartate; both forms could utilize glucose, lactate and alanine.

1628. LIEB, M.
Ultraviolet-induced forward and reverse mutation in *E. coli*.
Genetics 1950 : **35** : p. 675. (Abst.).

Ultraviolet irradiation of *Escherichia coli* resulted in the mutation of h + to h — (histidine requiring) and the reversion of h — to h +. Zero point h + mutants did not occur. No phenotypic expression of induced h + mutants was shown, even after 24 hours, if h — bacteria were placed in the nutrient medium without histidine. The frequency of mutants increased slowly with dose; at 1% survival a tenfold increase in frequency of mutants was obtained. Zero point h — mutants were recovered. The relative mutability of h — and h +, when treated with ultraviolet light, was similar to their relative spontaneous mutability. Some evidence has been obtained that the h — and h + mutants are dependent upon changes in a single gene.

1629. DAVIS, B. D.
Phenomic delay in radiation-induced reversion of *E. coli* auxotrophs to nutritional independence.
Genetics 1950 : **35** : 661–62. (Abst.).

Strain Tryp⁻ 19–2 of *Escherichia coli* shows little induced reverse mutation after irradiation in washed suspension and plating on minimal medium. With a trace of tryptophane, however, an increase in the reversion rate of up to 300-fold occurs in irradiated inocula. Similar effects of trace additions have been obtained with other aminoacid, purine and vitamin auxotrophs. The phenomenon is probably true phenomic delay; the gene has mutated but cannot begin to form the previously deficient enzyme until the cell is supplied with the product of that enzyme. This effect implies that the metabolic turnover of the non-growing cell fails to provide a substrate, or to exhaust an inhibitor, of some reaction essential for the synthesis of the previously deficient enzyme. In most strains reversions are heterogeneous with respect to growth rate, as are prototrophs obtained by genetic recombination. Reversions were induced by radiation in all the auxotrophs examined, but not in a lac⁻ strain, having a spontaneous reversion frequency of 2×10^{-6}.

1630. NOVICK, A. and
SZILARD, L.
Experiments with the chemostat on spontaneous mutations of bacteria.
Proc. Nat. Acad. Sci., Wash. 1950 : **36** : 708–19.

Spontaneous mutation of *Escherichia coli* was studied by means of the chemostat, a device for growing a bacterial population over an indefinite period at a rate considerably lower than normal, by maintaining the concentration of one growth factor at a sufficiently low value while other nutrients are supplied in high concentrations. The mutant strain B/1 and mutants derived from it were used in the experiments; B/1 is resistant to bacteriophage T_1, sensitive to bacteriophage T_5, and requires tryptophane as a growth factor.
Spontaneous mutation to phage resistance was analysed in strain B/1/f, possessing the ability to grow faster than the parent strain B/1 at very low concentrations of tryptophane. When B/1/f was maintained at a high concentration of tryptophane, the rate of mutation to resistance to T_5 per bacterial generation increased proportionately to the generation time;

the number of mutations produced per unit time per bacterium remained constant. These and other data suggest that the mutation was a monomolecular reaction. In a similar experiment on mutation to resistance to T_6, the density of mutants also appeared to rise linearly with generation time but the results were not sufficiently accurate to state whether this mutation also occurred at a constant rate per unit time per bacterium for different generation times.
Mutants resistant to T_4 were selected against when grown with either lactate or tryptophane concentration as the limiting factor, i.e. the number of mutants remained at a fixed level after an initial rise.
Finally, it was found that strain B/1/f, when grown at low tryptophane concentration for a long period, underwent a number of mutational steps, each one leading to a strain more "fit" than the previous one, i.e. with faster growth rate, and that each step in this process of evolution could be detected by the shifts appearing in the curve of the mutants resistant to T_5. During a change over from the parent strain to the faster growing form, the number of mutants resistant to T_5 may be expected to fall; after the change over the concentration of the mutants resistant to T_5 again increases linearly with number of generations.

1631. Brandenburg, E.
Über ein pilzliches Toxin in der Gattung *Pythium* und seine Wirkung auf die Wirtspflanze. (**On a fungous toxin in the genus *Pythium* and its action on the host plant**).
Z. Pflkrankh. 1948 : **55** : 129–38.

Among other points, the pathogenicity of various strains of *Pythium irregulare* in relation to toxin formation is discussed; and the results of experiments with beets on the transference of the virus-like toxin from highly pathogenic strains of the fungus to weak strains are recorded.
The possible significance of these toxic protein substances in intensifying the pathogenic action of *Pythium* is suggested.

1632. Marcelli, E.
Ulteriori osservazioni sulla specializzazione dell'"Oidio" del tabacco. (**Further observations on specialization of "Oidium" of tobacco**).
Tabacco 1950 : **54** : 330–32.

A further analysis (cf. Abst. 507) of evidence from other investigators and from the writer's own experiments has led him to conclude that the fungus found on his tobacco plants was actually a specialized form of *Erysiphe Cichoracearum*, which he designates *E. Cichoracearum* f. *Nicotianae*.

1633. Roegner, F. R.,
Stahmann, M. H. and
Stauffer, J. F.
The mutagenic action of ultraviolet radiation and N-mustards on *Penicillium chrysogenum*.
Amer. J. Bot. 1950 : **37** : p. 670. (Abst.).

Morphological variants were induced by treatment of spores of *P. chrysogenum* with ultraviolet radiation or nitrogen mustards. The two kinds of treatment resulted in fairly similar frequencies and types of variants. The variants differed greatly in number and type from spontaneous variants of the parent strain. The variants among the survivors of either treatment included a large percentage of unstable mutants which reverted to the parent type. Most of the remaining variants retained their colony characteristics through several transfers. The rate of mutation due to ultraviolet radiation (2750 Å) gradually increased to a maximum and then declined; the relationship between dosage and mutation rate thus resembled that observed with other fungi. The induction of variants by the nitrogen mustards closely paralleled the killing action of their compounds; variants continued to

increase throughout the course of the treatment. The greatest killing and mutagenic effects occurred during the first few minutes of treatment. Both types of treatment were also effective in inducing variants which require certain organic substances for growth or fail to produce penicillin or pigment.

1634. Swanson, C. P. and
Goodgal, S. H.
The effect of metabolic inhibitors on the ultraviolet-induced mutation rate in *Aspergillus terreus*.
Genetics 1950 : **35** : 695–96. (Abst.).

Metabolic inhibitors have been tested as possible agents modifying the frequency of mutations induced by ultraviolet radiation in *A. terreus*. The agents were used in the form of a pretreatment for 30 minutes at a concentration of 0·001 M in an unbuffered aqueous solution; the frequency of morphological mutations served as the criterion of effect. KCN exerted no mutagenic action when used alone or as a modifying agent applied in combination with ultraviolet radiation. DNP produced a considerable increase in the mutation rate induced by ultraviolet light; when used alone it exhibited no mutagenic effect. DNP showed no selective action on survival. Preliminary experiments indicate that post-treatments with DNP and non-mutagenic concentrations of nitrogen mustard also increase the frequency of mutations induced by ultraviolet treatment. The results therefore provide support for the hypothesis that ultraviolet radiation produces mutation by an indirect rather than a direct process.

1635. Kaplan, R.
Photodynamische Auslösung von Mutationen in den Sporen von *Penicillium notatum*. **(Photodynamic induction of mutations in the spores of *P. notatum*).**
Planta 1950 : **38** : 1–11.

The relation between mutation rate and dosage was studied in experiments with *P. notatum*, treated either with visible light after pretreatment with erythrosin, or with ultraviolet light. The curves connecting mutation rate with dose are interpreted as showing that mutation is a single-hit phenomenon while spore killing results from double or triple hits.

1636. Wilson, L. G. and
Stauffer, J. F.
Relative effectiveness of various wavelengths of ultraviolet in inducing biochemical variants in *Penicillium chrysogenum* NRRL 1951.
Amer. J. Bot. 1950 : **37** : p. 671. (Abst.).

Biochemical variants of *P. chrysogenum* were induced by treatment of spores with different dosages of 2534, 2750, 2900 and 2590 Å. Wavelength 2534 Å was the most effective in inducing such variants. The majority of the mutants required specific aminoacids, vitamins or adenine. The most significant differential effect noted was the high incidence of vitamin deficient variants induced by 2534 Å.

1637. Olive, L. S.
A cytological study of ascus development in *Patella melaloma* (Alb. and Schw.) Seaver.
Amer. J. Bot. 1950 : **37** : 757–63.

Chromosomal behaviour in the ascus of *P. melaloma* has been analysed by the propionocarmine staining technique. No evidence of two nuclear fusions and brachymeiosis was obtained; the results do not therefore support the claim of H. C. I. Gwynne-Vaughan.

Four pairs of chromosomes are present in the primary nucleus of the ascus; in all three nuclear divisions four chromosomes pass to each spindle pole. The chromosomes are morphologically distinguishable, the nucleolar chromosome being the longest.

1638. Boone, D. M.
Linkage groups in *Venturia inaequalis*.
Phytopathology 1951 : **41** : p. 4. (Abst.).

Using 20 mutant characters, two loci for pathogenicity and the locus for mating type, the linkage groups of the apple scab pathogen were studied in serially isolated individuals grown from the ascospores of 3500 asci. Some 2000 other asci were examined to determine the segregation of mutant factors causing ascospore abortion. Genes were located by Lindegren's method by which one-half the percentage of second division segregation of a gene pair is taken as the uncorrected distance in cross over units of the pair from its centromere. Although studies of recombination of loci have not been completed, there is evidence that marker characters for four chromosomes have been found; five linkage points, including the centromere, are indicated in group I, four in group II, three in group III and two in group IV. The genes conditioning pathogenicity and mating type are among those not yet located.

1639. Fincham, J. R. S.
A comparative genetic study of the mating-type chromosomes of two species of *Neurospora*.
J. Genet. 1951 : **50** : 221–29.

Previous investigators have found that a much lower frequency of crossing-over between the locus for mating type and the centromere occurs in *N. crassa* than in *N. sitophila*. Marker genes linked with the locus for mating type were transferred from one species to the other by hybridization and back-crossing, and the linkage relationships of these genes analysed. The data obtained suggest that chiasma frequency in the centromere region is reduced in *N. crassa* as compared with *N. sitophila*, and that the chromosomes of the two species bearing the locus for mating type are largely homologous. The difference in chiasma formation appears to lie in the extent to which the centromere interferes with crossing-over in its vicinity. It is pointed out that genetic control of chiasma frequency must have been an important evolutionary factor within the genus.

1640. Bonner, D. M.
The Q locus of *Neurospora*.
Genetics 1950 : **35** : 655–56. (Abst.).

The locus *Q* in *N. crassa* governs niacin formation. Strain 3416, possessing this locus, requires niacin, is unable to utilize any known niacin precursor and accumulates quinolinic acid. Three independent mutants involving *Q* are known: strain 1–(3416), 2–(Y–30166) and 3–(Y–31873). Heterocaryons were obtained between these mutant strains, using double biochemical mutants and forcing heterocaryon formation in the presence of niacin. Each heterocaryon remained dependent on niacin. Crosses of these strains were made in all combinations. Serial isolation of ascospores gave only parental cultures. Isolation of whole perithecia, however, resulted in occasional niacin-independent cultures, the frequency of which depended upon the cross. The data at present available do not prove that these niacin independent cultures result from crossing-over; but they suggest that the expression of locus *Q* depends upon three units, all of which must be present in the same linkage group. Genetically, these units appear to be three closely linked genes. Biochemically, however, they appear as three component parts of a larger unit which is necessary for the single specific reaction characteristic of niacin formation. It is pointed out that recent investigations on *Drosophila* and maize also suggest that certain genes have a complex structure.

1641. Goodgal, S. H.
The effect of photoreactivation on the frequency of ultraviolet induced morphological mutations in the microconidial strain of *Neurospora crassa*.
Genetics 1950 : **35** : p. 667. (Abst.).

The frequency of induced mutants among survivors of microconidia treated with ultraviolet radiation was reduced by posttreatment with photoreactivating light. The effect of photoreactivation on mutation rate induced by ultraviolet radiation was similar to that of photoreactivating light on survival, i.e. to reduce, in effect, the dosage of ultraviolet light in accordance with Kelner's dosage reduction principle. Two alternative possibilities are suggested to explain the observed correlation between killing and mutation: (1) the killing effect is due to lethal mutation and photoreactivation prevents the induction of mutations; or (2) killing and mutation are due to a common mediator produced by ultraviolet radiation and inactivated by photoreactivating light.

1642. Zalokar, M.
Production of p-amino benzoic acid in *Neurospora* and adaptation to sulfonamides.
Genetics 1950 : **35** : p. 700. (Abst.).

Neurospora becomes resistant to sulphonamides by adaptation, not transmissible through the sexual cycle, or by mutation. It has been suggested that adaptation of microorganisms to sulphonamides may be due to increased production of p-aminobenzoic acid. The amount of p-aminobenzoic acid produced by different strains of *Neurospora* has therefore been determined. The wild strain and the strains requiring sulphonamide produce approximately 10^{-7} molar solution of p-aminobenzoic acid in 7 days; the strain with the gene for sulphonamide resistance shows a slightly higher production. The wild strain, adapted to sulphonamide by gradual transfers to higher concentrations, shows about five times as high a concentration of p-aminobenzoic acid in the culture liquid; the capacity to produce more p-aminobenzoic acid is retained during at least two subsequent transfers in the absence of sulphonamide. Crossing experiments are in progress to determine whether the change is genetical or adaptive.

1643. Maas, W. K.
Studies on the mechanism of temperature-sensitive mutation.
Genetics 1950 : **35** : p. 677. (Abst.).

Mutants which lose their nutritional requirements with shift of temperature have been described in *Neurospora* and *Escherichia coli*. Mechanisms suggested, but not proved, have included a gene for sensitiveness to temperature, a temperature-sensitive enzyme and control of the biochemical reaction by different genes at each temperature. Experiments on a mutant requiring pantothenate at 37° but not at 25° indicate another mechanism, viz. production of an inhibitor resulting from metabolic activity.

1644. Andersson-Kottö, I.
Mutations in antiserum treated *Neurospora*.
Hereditas, Lund 1951 : **37** : 289–90. (Abst.).

Treatment of macroconidia of a wild type strain of *N. crassa* with antiserum resulted in biochemical mutants. No evidence of mutation in antigenic properties was obtained. It is not known whether the appearance of the mutants is due to direct induction or selection.

1645. Fox, A. S. and
Gray, W. D.
Enzymatic (tyrosinase) differences between the mating types of strain 15300 (albino-2), *Neurospora crassa*.
Genetics 1950 : **35** : p. 664. (Abst.).

It has been demonstrated that mating type a of strain 15300 possesses a tyrosinase not present in A. This enzyme may be associated with small cytoplasmic particles, such as

mitochondria or microsomes. Preliminary crosses have not resulted in recombination of mating type and tyrosinase production, but sufficient genetical data have not yet been obtained to warrant the conclusion that the enzymatic difference may be attributed to the mating type locus.

1646. Landman, O. E.
Formation of lactase in mutants and parental strains of *Neurospora*.
Genetics 1950 : **35** : 673–74. (Abst.).

Five mutants of *N. crassa*, each characterized by poor growth on lactose, have been found to have much lower rates of lactose formation than the parent strain Emerson 5256A. Two genetic classes affecting lactase production have been definitely established; data from heterocaryons suggest that as many as six loci may be involved.

1647. Greis, H.
Mutations- und Isolationsversuche zur Beeinflussung des Geschlechtes von *Sordaria fimicola* (Rob.). (Ein Beitrag zur Frage nach der Stabilität und Labilität der Sexualreaktionen bei Monözisten und Diözisten). [**Researches on mutations and the isolation of mutants controlling sex in *S. fimicola* (Rob.). (A contribution to the question of the stability and lability of the sexual reaction in monecious and diecious strains**)].
Z. Bot. 1941/42 : **37** : 1–116.

By X-irradiating typically labile monecious cultures of *S. fimicola*, mictohaplontic and diecious strains of varying degrees of sexual expression were obtained.
An apparent case of tetrapolar compatibility was shown to be an instance of bipolarity masked by additional sterility factors.

1648. Struble, F. B. and
Keitt, G. W.
Variability and inheritance in *Glomerella cingulata* (Stonem.) S. and V.S. from apple.
Amer. J. Bot. 1950 : **37** : 563–76.

G. cingulata presents the unusual situation of commonly producing through its ascigerous stage, with or without cross fertilization, uniform plus or minus types with strikingly distinctive characters. Seven types have been differentiated: plus A, plus B, minus A, minus B, degenerate minus, conidial and chromogenic. Experiments on the compatibility reactions of plus and minus cultures are described. Not all plus and all minus cultures from the same host, viz. the apple, were compatible; this result suggests that more than one gene pair is involved in the inheritance of compatibility. It is not certain whether the minus type occurs in nature; possibly it is primarily or exclusively a cultural mutant form. Treatment of conidia of a plus A culture with ultraviolet radiation induced a variety of mutants, including minus A, minus B and degenerate minus.
Response to nicotinic acid appears to be conditioned by a single gene.

1649. McGahen, J. W.,
Wheeler, H. E. and
Chilton, S. J. P.
Factors conditioning sexuality in a *Glomerella* from *Ipomoea*.
Phytopathology 1951 : **41** : 25–26. (Abst.).

Loci on at least two chromosomes affect sexuality in *Glomerella*. Genes at loci *A* and *B* produce either self fertile, partially self sterile or heterothallic cultures which may or may not produce perithecia. Locus *A* controls the origin of sexual structures but their number and arrangement are controlled by locus *B*; in addition, 30 other biochemically mutant genes affect some phase of the sexual process.

1650. WAGNER, R. P. and
HADDOX, C. H.
The *in-vivo* synthesis of pantothenic acid by "pantothenicless" *Neurospora*.
Genetics 1950 : **35** : 697–98. (Abst.).

Further evidence has been obtained that the pantothenicless mutants 5531 and 34556, induced by X-rays and ultraviolet light respectively, possess the enzyme system necessary to effect the synthesis of pantothenate from the precursors β-alanine and pantoyl lactone, but are prevented from doing so by some, as yet unknown, mechanism (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 2424).

1651. FOX, A. S. and
GRAY, W. D.
Antigenic differences between the mating types of strain 15300 (albino-2), *Neurospora crassa*.
Genetics 1950 : **35** : 664–65. (Abst.).

Tests of antisera produced by intraperitoneal injection of rabbits have indicated that mating types A and a of strain 15300 differ in antigenic properties. Genetic disparity other than that of mating type is responsible for at least part of the antigenic differences. However, since the antigenic properties of the F_1 cultures are still closely related to the corresponding parental mating type, a portion of the original parental mating type may also be due to the mating type locus. Further investigation is required to identify the antigenic fractions strictly attributable to the action of the alleles for mating type.

1652. WINGE, Ö. and
ROBERTS, C.
The polymeric genes for maltose fermentation in yeasts, and their mutability.
C. R. Lab. Carlsberg, Copenhagen 1950 : Sér. Physiol. : **25** : 35–83.

In agreement with the results of genetic analyses in a paper previously summarized (cf. Abst. 856), a series of investigations using progeny of the hybrid *Saccharomyces cerevisiae* x *S. Chevalieri* has demonstrated the presence of four polymeric genes M_1, M_2, M_3 and M_4 controlling maltase production. X-ray irradiation and occasional spontaneous mutations have shown that mutation from the dominant gene conferring the capability of fermenting maltose, to the non-fermenting recessive state, is possible; attempts to produce back mutations from non-fermenting mutants, or to induce mutations to dominant genes in the completely recessive *S. Chevalieri*, have been unsuccessful. It is suggested that the presence of several genes controlling fermentative ability, from which no advantageous cumulative effects have so far been perceived, possibly guards against the loss of the fermenting capacity by mutation of a single gene; another supposition is that each *M* gene influences additional specific reactions. Although three different yeast types with M_1 became adapted to maltose fermentation more readily than eight different genotypes possessing M_3, it has not been possible to distinguish any biochemical differences between the *M* genes; they may be biochemically identical.
These results of analyses of the characters influencing maltase production are used to refute Lindegren's hypothesis, in which a hitherto unknown method of inheritance is supposed to be operative in the Saccharomycetaceae. Some of the segregation ratios obtained by Lindegren may have resulted from polymeric genes; others may be explained by the formation of less than eight ascospores from an ascus originally containing eight nuclei. There is also the possibility that overlapping generations were present.
During the experiments 81 previously unrecorded hybrids were produced.

1653. YAMAMOTO, Y.
(An intergeneric yeast hybrid).
Bot. and Zool. 1940 : **8** : p. 916. [Japanese].

A description is given of the yeast hybrid *Zygosaccharomyces Sake* x *Saccharomyces Shaoshing*.

1654. Krishna Murthy, S. N. and
Subramaniam, M. K.
Temperature as a selective factor for yeast mutants.
Curr. Sci. 1951 : **20** : 17–18.

Temperature has been found to affect the growth of yeast mutants and thus to exert a selective influence; it does not inhibit a mutational step. For the Rough II type the optimum temperature for growth is 30–31° C.

1655. Subramaniam, M. K. and
Prahlado Rao, L. S.
Lyophilization and mutation in yeast.
Experientia, Basel 1951 : **7** : 98–99.

Mutant types similar to those occurring spontaneously as a result of gene mutation were derived from lyophilized culture of yeast. In the process of lyophilization the culture is cooled suddenly to a very low temperature.

1656. Raut, C.
A cytochrome deficient variant of *Saccharomyces cerevisiae*.
Genetics 1950 : **35** : p. 686. (Abst.).

The occurrence of a mutant form, induced by ultraviolet radiation, showing absence of all cytochrome bands and no absorption of oxygen during glucose fermentation is reported; the data from a cross of the variant with the normal form indicated that the mutation of a single gene involved in cytochrome production had occurred.

1657. Ulbrich, M. and
Saller, W.
Zusammenhänge zwischen Einzelsporenkultur und Alkoholbildungsvermögen von Weinhefen. (**The relations between single-spore cultivation and the alcohol formation capacity of yeasts used for wine production**).
Mitt. höh. Bundeslehr- u. VersAnst. Wein-, Obst- u. Gartenbau Wien-Klosterneuburg, Bienenkunde Wien-Grinzing 1951 : **1** : 28–33.

Using the Zeiss micromanipulator, four spores from an ascus of a race of *Saccharomyces cerevisiae* var. *ellipsoideus* were isolated and their progenies compared, as regards fermentation properties, with vegetatively produced yeast cells from the same race. The results showed that, in the single case investigated, isolation of the spores led to an increase in the amount of alcohol produced during fermentation. Whether this property will be retained or will diminish in subsequent generations must still be ascertained.

1658. Beams, H. W.,
Zell, L. W. and
Sulkin, N. M.
Cytological studies on yeast cells with special reference to the budding process.
Cytologia, Tokyo 1940 : **11** : 30–36.

The observations reported show that the cells of *Saccharomyces cerevisiae* have a definite, compact, Feulgen positive nucleus, that the division of the nucleus during the budding process appears to be amitotic, and that strong concentrations of colchicine do not inhibit the budding process.

1659. Lindegren, C. C. and
Lindegren, G.
Chromosome maps in *Saccharomyces* of genes controlling the fermentation of carbohydrates and the synthesis of vitamins, amino acids and nucleic acid components.
Genetics 1950 : **35** : 675–76. (Abst.).

Details are given of the results of mapping four or five chromosomes in *Saccharomyces* for genes controlling the fermentation of carbohydrates and synthesis of various nutrient substances. From the data available it is not known whether chromosomes IV and V are different.

1660. Holton, C. S. and
Lowther, C. V.
Heritability of number of primary sporidia produced by spores of *Tilletia caries* and *T. foetida*.
Phytopathology 1951 : **41** : 172–77.

The number of sporidia produced by different races of *T. caries* and *T. foetida* is a heritable character. The nature of the inheritance of this character could not however be estimated from the data obtained.

1661. Stakman, E. C. and
Rowell, J. B.
Inorganic compounds inducing mutation in *Ustilago zeae*.
Amer. J. Bot. 1950 : **37** : 670–71. (Abst.).

Uranyl nitrate, thorium nitrate, sodium arsenite, lithium chloride, mercury bichloride, copper sulphate and tantalum potassium fluoride were effective in inducing mutants in *U. Zeae*. Mutants were produced in both haploid and diploid lines, regardless of whether the lines were stable or unstable. Studies of some of the mutants revealed differences in cultural, morphological and pathogenic characters. The process of mutation was intensified by high temperature and ageing. All the above mutagenic substances are inhibitory to growth, and the mutant sectors in the colonies were produced in a narrow range of concentration near the threshold of complete growth inhibition.

1662. Fuchs, W. H.
20 Jahre genetische Untersuchungen an Rostpilzen. (**Twenty years of genetical investigations on rust fungi**).
Z. PflKrankh. 1949 : **56** : 186–90.

A brief summary is given of 35 works on hybridization between rust races in Canada, the USA and elsewhere.

1663. Mittwoch, U.
Studies in the genetics of some X-ray-induced morphological mutants in *Coprinus lagopus*.
J. Genet. 1951 : **50** : 202–05.

Investigations on the mating system of *Coprinus* are reviewed. Mating type is determined by two pairs of Mendelian factors, and if mating is to take place, the primary mycelia must differ in both of these pairs; in the present paper the gene pairs for mating type are designated a_1a_2 and b_1b_2. The independent inheritance of the genes for mating type was confirmed by data on monosporous strains resulting from the crosses a_1b_1 x a_2b_2 and a_2a_1 x a_1b_2. Four morphological mutants induced by X-irradiation are described, one of which exhibited linkage with locus b for mating type. The possible action of natural selection with regard to the binucleate condition of the secondary mycelium is discussed.

1664. PAPAZIAN, H. P.
Physiology of the incompatibility factors in *Schizophyllum commune.*
Bot. Gaz. 1950 : **112** : 143–63.

The following nomenclature is recommended for general adoption: monocaryon, for a mycelium containing only one kind of nucleus as regards mating reaction, hitherto designated primary, haploid or single spore mycelium; heterocaryon, for a mycelium containing two or more different nuclei; dicaryon, for the "secondary mycelium" containing conjugate nuclei; *A* and *B*, incompatibility factors at two loci, specifically identified by superscripts; and dimon matings, matings involving diploidization of a monocaryon by a dicaryon. Experiments on *S. commune* have provided information on (1) the different types of interaction of monocaryons having similar or dissimilar incompatibility alleles; (2) patterns of nuclear behaviour in dimon matings; (3) origin, morphology and physiology of an anomalous type of monocaryon designated "streak"; and (4) patterns of diploidization in compatible dimon matings.
Four distinct types of reaction were obtained in matings between monocaryons of any stock, depending upon the alleles at each locus; matings A^1B^1 x A^2B^2, A^1B^1 x A^1B^1, A^1B^1 x A^2B^1 and A^1B^1 x A^1B^2 gave dicaryotic, overlap, "barrage" and "flat" mycelia respectively. The flat and barrage forms are heterocaryons; only a minority of the cells of flat hyphae, however, contain more than one nucleus. Both forms always diploidize unilaterally and do not produce clamp connections themselves.
Three types of dimon matings have been distinguished: (1) hemicompatible, i.e (A^1B^1 x A^2B^2) x A^1B^1, in which one of the nuclei of the dicaryon is compatible with that of the monocaryon; (2) non-compatible, i.e. (A^1B^1 x A^2B^2) x A^1B^2, in which neither nucleus is compatible; and (3) compatible, i.e. (A^1B^1 x A^2B^2) x A^3B^3, in which both nuclei are compatible. Diploidization is much more regular in hemicompatible than in non-compatible dimon matings. It was also found that a new nucleus is sometimes formed in the latter type of mating.
The aberrant type of monocaryon, termed streak, is obtained from mixtures of two monocaryons having common *A* factors, i.e. from the so-called flat growths; it resembles the flat form in diploidizing unilaterally in compatible matings. Heterocaryosis is thus not the only condition giving rise to unilateral diploidization. Evidence has been obtained that streak is a single gene mutant.
Certain regular departures from random diploidization were observed in compatible dimon matings: in some cases a new nucleus was superfluously formed; in others both nuclei of the dicaryon migrated into the monocaryon, displacing its nuclei.

1665. TRESCHOW, C.
Taxonomy of the cultivated mushroom.
Friesia, København 1945 : **3** : 124–28.

A further solution of the controversial subject of the systematic position of the cultivated mushroom is suggested. To consider the cultivated mushroom as a variety of the field mushroom, *Psalliota campestris*, is condemned. *Ps. bispora* f. *Avellana*, which designates the cultivated brown strain, and *Ps. bispora* f. *albida*, the cultivated white strain, are differentiated from the field species on the morphological bases of divergences in number of nuclei in the mature basidiospore, the absence of cystidia in the field species and the regular production of 4 spores on each basidium in the field species but only 2 in the cultivated species. The occasional discovery of wild specimens with a few basidia producing only 2 spores, and the occurrence of a few 1, 3 and 4 spored basidia in some cultivated individuals have led to the suggestion that the cultivated species are phylogenetically younger, having arisen by mutation. The origin would have to be sought in wild forms able to grow in compost rather than in the *campestris* forms which show preference for a field habitat.

1666. Stover, R. H.
Physiological specialization and mutations in *Thielaviopsis basicola*.
Phytopathology **1951 : 41** : p. **34**. (Abst.).

The naturally occurring brown and grey forms of *T. basicola* mutate from one to the other. The mutation from the grey wild type to the brown occurs only while existing within tobacco and leguminous hosts; the mutant possesses the increased virulence associated with the brown wild type. The reverse mutation from brown to grey occurs both in culture and in a natural host. Evidence is presented that the mutation from the grey to the brown wild type is associated with the parasitic mode of life, with emphasis that it is an essential phase in the evolution of virulence on a specific host.

1667. Luria, S. E.
Spontaneous mutations in the study of virus reproduction.
Genetics **1950 : 35 : 676–77**. (Abst.).

An analysis was made of the frequency and distribution of the mutants *r* and *w* in the yields of phage T2 from individual bacteria. The frequency of infected bacteria liberating mutants was approximately 2×10^{-2}. The distribution of the mutants was clonal, each clone comprising between 1 to 20 mutants or more. Genetic crosses indicated the allelism or probable identity of mutants from one clone and the non-allelism of mutants from different clones. The clone frequency of mutations diminished with increasing clone size; the frequency distribution of clone sizes agreed well with the frequency expected by assuming logarithmic reduplication of the genetic material of the phage, with a constant probability of mutation per reduplication. The mutation rate calculated on this basis is between 1×10^{-4} and 5×10^{-4} mutations per reduplication. Since the mutant phenotypes *r* and *w* probably result from mutations at any one of over 100 loci, the mutation rate per reduplication is probably lower than 10^{-6}. Recombinants of each given type show a random non-clonal distribution in individual bacteria, suggesting that recombination takes place in the host cell after the reproduction of the genetic material of the phage.

CROP PLANTS

1668.
Colonial Research 1949-50. Committee for Colonial Agricultural, Animal Health and Forestry Research Fifth Annual Report (1949-1950).
Colonial Office, London 1950 : 103–23.

Rice
Varietal introduction and selection have been continued at Rokupr, Sierra Leone; there are now 157 strains under observation, including material from British Guiana, Malaya, Pakistan, Portugal and Hungary.

Fibre crops
The new Cotton Research Station of the Empire Cotton Growing Corporation at Namulonge, Uganda, is being rapidly developed and will act as the centre of cotton research for all cotton growing Colonies (cf. Abst. 1185).
In Malaya, varietal trials of Manila hemp are being conducted. A collection of clonal lines of ramie has been established at Serdang; they vary widely in height, tillering and maturation period. It is hoped that varieties suitable for local conditions can be selected from this material.
Trials on strains of *Hibiscus cannabinus* and wild *Honckenya* are in progress in Nigeria.

Cassava
At the Amani Station, the former East African Agricultural Research Institute, field trials of a large number of clones bred for resistance to mosaic and brown streak have been

continued. Until recently, cassava in East Africa has been solely a peasant crop but some interest is now being shown in its production on a plantation scale with a view to the extraction of starch for export to Great Britain; selected clones are being tested for this purpose.

Coffee

Clonal selection trials were carried out at the Lyamunga Coffee Research Station, Tanganyika.

Cacao

The following are among the activities in the West Indies: testing of ICS clones; establishment of a collection of cacao types, *Theobroma* spp. and allied genera; genetical studies; breeding, including the production of strains resistant to witches' broom; and analysis of variability in bean composition.

Work on the production of improved types continued at the West African Cacao Research Institute, Gold Coast (cf. Abst. 2061).

Tung

At the Tung Experiment Station, Cholo, Nyasaland, the production of high yielding clones is progressing satisfactorily.

Oil palm

Work on the development of high yielding, disease resistant strains is now well-established at the Oil Palm Research Station, Benin, Nigeria.

Banana

In the West Indies the breeding of male parents carrying the factors for immunity from Panama disease has now reached the stage at which not much further progress can be made until the projected expedition to South East Africa can be carried out. In both Trinidad and Jamaica, crossing of available male parents with Gros Michel and related varieties, and testing of the resulting families for resistance to Panama disease, *Cercospora* leaf spot and other characters, including ripening and storage behaviour under refrigerated conditions, are continuing; a study is also being made of the conditions affecting the fertility of Gros Michel crosses, the percentage germination of *Musa* seeds and the relative vigour of triploids and tetraploids.

1669.

Nineteenth Annual Report of the Minister for Agriculture 1949-50. Dep. Agric. Dublin Pp. 189 + 87.

Seed testing and Economic Botany Division. (*pp. 78–80*).

As a result of the survey carried on for several years in connexion with blind seed disease (*Phialea temulenta*) of ryegrass, it has been noted that commercial strains appear to be more resistant than many of the more recently developed strains. Steps to promote international cooperation between seed analysts, phytopathologists and plant breeders concerning the problems of this disease have been undertaken.

Seed Propagation Division. (*pp. 80–85*).

Information is given on the propagation of varieties and new hybrid selections of wheat and barley. Recent selections of swede are also being propagated. In addition, reports of the following experiments on barley are included: a small scale test of eight new selections developed at the Cereal Station, Ballinacurra, Co. Cork, in comparison with the standard Spratt-Archer 37 No. 3; a drill strip trial of Hume's Archer 1, Spratt-Archer x Archer 14 and Spratt-Archer x Archer 20, also recently bred at the Cereal Station, against the standard Spratt-Archer 37 No. 3; and (3) a large scale test, conducted at 11 centres, to compare the varieties Spratt-Archer 37 No. 3, Binder, Spratt-Archer x Kenia 17 and No. 5.

Appendix. Report of the Agricultural Department, University College, Dublin, for the year 1949–50. (*Pp. 1–19*).

Wheat
A trial was carried out on the winter wheats Glasnevin Rosa, Ironmaster x Desprez 3/8, Redman-Pajbjerg, Staring, Pajbjerg 5 and Svalöf Steel. The results of this and previous trials have shown that Glasnevin Rosa is superior to the other varieties tested in (1) weight of grain per plot, (2) weight of ear and (3) size and weight of grain. As this variety is resistant to lodging and practically immune from attacks of yellow rust, it is likely to prove suitable for growing on good soils with high lime content. In a trial of spring wheats, Kärn was significantly superior in yield to the other varieties tested, comprising Hume's, Progress, Atle, April Red-Ironmaster-Pajbjerg and Cascade.
Derivatives of the following hybrids are among the material under observation: 903 x Atle, 903 x Fylgia, Atle x Fylgia, Progress x Cascade and Kärn x Cascade.

Oats
The following varieties and hybrids were tested: Richies 34/75, Binder-Onward Star 5, Star, Triumph-Star, Bonstar-Success and Glasnevin Bonstar. The first two gave the highest yields, being approximately equal in productivity; but it is unlikely that either of these varieties will be used since they lodge under conditions of high fertility.
Derivatives of Bonstar x Acton, Richies 34/75 x Glasnevin Success show promise.

Barley
New high yielding, short-strawed varieties are now under test. They are capable of standing on rich soils even in wet seasons but are only suitable as fodder barleys.

Grasses and clovers
Indigenous strains of cocksfoot, perennial ryegrass, timothy and red clover have proved to be very satisfactory for permanent and semipermanent pastures. Two new strains of the cocksfoot Glasnevin are being developed. The production of a mowing strain of timothy, a general purpose strain of meadow fescue and leafy hay types of Italian and Westerwolds ryegrass is to be undertaken.
Intensive study of *Poa pratensis* has been initiated.
Small scale variety tests of lucerne are in progress.

Mangels and Swedes
Varieties and selected strains were compared for total yield and percentage of dry matter.

Potato
Yield trials of recently introduced varieties are in progress. Investigations on the reaction of seedlings to leaf roll were continued. Like their parents, certain of the seedlings were field immune. A test was carried out on 26 varieties for reaction to paracrinkle virus; upon inoculation 14 developed discoloration of the tuber flesh.

Strawberry
Crosses between Huxley and American varieties were effected.

Vegetables
Selection of Brussels sprouts and cabbage continued.
Seed was saved from a strain of the onion Solidity which appeared to show resistance to mildew.
In tomato breeding for resistance to *Cladosporium*, it was found that the most highly resistant varieties had the smallest fruit owing to the fact that the immune tomato Red Currant was involved in their ancestry. Back crosses have therefore been made with large fruited commercial varieties.

1670. Bell, G. D. H.
Some British plant breeding problems.
Agric. Progr. 1950 : **25** : 15–24.

The general agricultural background of plant breeding problems in Britain, formed by national policy, economic considerations within the agricultural industry, climatic and

other growing conditions, and technical changes and developments in farming, are discussed. Current problems in the breeding of wheat, barley, oats, sugar beet, potatoes and field beans and peas are assessed; and ways in which they are being tackled at the Cambridge Plant Breeding Institute and other stations are outlined.

1671. HOWARD, H. W.
Crops and plant breeding.
J. R. Agric. Soc. 1950 : **111** : 129–39.

Recent work on crop production and breeding in the United Kingdom are surveyed against the background of the need for increased home production of cereals and an intensified programme of grassland development. Sections are included on: varieties and species of herbage plants recently studied in trials or introduced; cereal varieties provisionally recommended and cereal variety trials; and sugar beet, with reference to diseases and variety tests.

1672. SULEĬMENOV, I.
(Agricultural science in the Kazah SSR).
Socialističeskoe Seljskoe Hozjaĭstvo (Socialistic Agriculture) 1950 : No. 8 : 54–58. [Russian].

References are made to Mičurinite progress in agriculture in Kazahstan, including the development of new varieties of spring wheats, forage plants, vegetables and potatoes at the Šortanda Research Station. The Kazah plant breeders are using large eared local wheats in selection work. Adapted forms for the principal climatic zones have been found and agricultural methods for the cultivation of these wheats developed.

1673. MALINOVSKIĬ, B. A.
(The Tulun Breeding Station during the postwar five year plan).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 7 : 13–19. [Russian].

Notes on Mičurinite selection work with cereals, forage plants, legumes and potatoes at the Tulun State Breeding Station, Siberia, during the period 1945 to 1950 are included.

Wheat
The spring wheat varieties Tulunka [Tulun], Udarnica [Shock Worker] and Sibirka 1818 [Siberian 1818], which were developed before 1946, have been released, while Tulun 197 and Taežnaja [Taïga] are still under trial. Both varieties are remarkable for productiveness, resistance to diseases and good baking and milling properties.
The following new hybrids will be submitted to state trials in the near future. Variety 164–H–203, from a local variety x (Udarnica x Garnet), a mid-season large-eared and large-grained vitreous spring wheat. It is resistant to lodging and is more productive and has a higher 1000 grain weight than the standard Lutescens 62.
Hybrid seed has been obtained from Tulunka pollinated with the hard wheat Coerulescens, and from branching wheats pollinated with Tulun 197 and Coerulescens.
Trials upon good soils of selected forms of Udarnica and local branching wheats and wheats with many florets are in progress.

Buckwheat
Intervarietal pollination of Belorusskaja [White Russian] has given Tulunskaja 1842 [Tulun 1842], which outyields the standard by 28%.

Oats
The varieties Baïkal and Sibirjak [Siberian] have been released, and the naked oat 139–H–9, from Tulunskiĭ 85/5 [Tulun 85/5] x a naked Mongolian oat, is under trial. The latter variety is resistant to loose smut and lodging and has done well in preliminary tests. The recently bred 88–H–51, from Onohoĭskiĭ x Kjuto [Köto], 82–H–168, from Ligovo 2 x

Tulunskiĭ 86/5, and 105–H–10, from Sibirjak x Žemčužina [Pearl], all remarkable for large grain and resistance to smut and lodging, have not yet passed the testing stage.

Rye

Natural intervarietal pollination has given the hardy, large-grained and lodging resistant winter rye varieties Tulunskaja 1335 and 1353 [Tulun 1335 and 1353] which surpass the standard in yield by 4 to 10 c. per ha. The method of free intervarietal hybridization has been used to improve Vjatka, which as a result has become as productive under Siberian conditions as the local Tulunskaja Zelenozernaja [Tulun Green Grain].

Barley

The variety Zalarinec has been released. A new naked barley, Coeleste 633, which is resistant to lodging, loose smut and spring drought, has been submitted to state trials. A new early maturing variety, 1927/9, has been obtained by individual selection from a local variety. It is productive and resistant to lodging, loose smut and pests, and shows a good response to fertilizers.

Millet

Tulunskoe 39/9 has been certified.

Forage plants

A timothy variety, Nikitaevskaja, and two clovers, Tulunskiĭ [Tulun] and Šeraguljskiĭ, are now available and a new, productive, hardy two-cut clover, 30/2, are being tried. An early variety of vetch, 1166, has been developed, which sets seed in the Irkutsk province. Its growth period is 10 days shorter than that of Kamalinskaja A–611.

Potato

The variety Sejanec 8/157 [Seedling 8/157] has been certified. It is productive and early, and its tubers have a good flavour. A more recently developed variety, 450, which is productive, early and resistant to *Phytophthora*, is under trial. Other promising new potatoes, still under trial, include 298 aa, 712 and 658. They all are productive and resistant to wart and other diseases. Trials were conducted with grafted material.

Pea

Several hybrids between local and cultivated varieties have been obtained by open pollination. The hybrids have large seeds and show resistance to diseases.

1674.

Arbetsplan för Weibullsholms Växtförädlingsanstalt för år 1950. (**Research programme for Weibullsholm Plant Breeding Institute for the year 1950.**) Pp. 39.

Issued in accordance with the stipulations of the grant from the Swedish government to the Weibullsholm Institute, this proposed programme of work follows the same arrangement as in previous years (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 1459). Section I contains information on variety trials, local trials of breeding material, the cytological laboratory and seed control. Section II concerns cereals, meadow and pasture plants, peas, oil crops, maize for silage, potatoes and root crops. Section III deals with various types of legumes, brassicas, cucumbers, leeks, carrots, parsnips, parsley, radishes, garden beets, lettuce, celery, spinach and tomatoes.

1675. Weibull, G.

Sorter och sortspridning inom våra stråsädesslag. Ett intressant fält för framtida undersökningar. (**Varieties and varietal distribution among our cereals. An interesting field for future investigations**). Weibulls Ill. Årsb. **1950** : **45** : 8–13.

One way of ascertaining how far and how rapidly the results of research on variety breeding and of trials in Sweden become known to the practical farmers and growers (cf. Abst. 199) would be to collect statistically reliable data on the different varieties of the various crops and their distribution throughout the country. A beginning has already been made in

Sweden to collect such information and the writer suggests how gaps and deficiencies in present sources might be avoided in future. A regular system of recording statistics of varieties, such as prevails in Holland, would ensure that too many varieties were not retained in commerce and cultivation.

1676.

Administration Report of the Agricultural Department (Travancore) for the year 1123 M.E. 1950 : Pp. 32.

Rice

Work on the production of improved strains from local and introduced material continued at the Moncompu and Adoor stations.

Sugar cane

As a result of varietal tests for 10 to 15 years, the canes POJ 2725, POJ 2878 and Co. 419 are recommended.

Coconut

Nurseries have been established at Kazhakuttam and Vaikom to raise, for distribution, disease free seedlings from selected seed coconuts.

1677.

Progress Report of the Institute of Plant Industry, Indore, Central India, for the year ending 31st May 1949 (1950) : Pp. 64.

Cotton

The results of trials of Malvi 9, Bhoj (Dhar 43), Jarila and other varieties at several centres are summarized.

Progress is reported in the development of strains of desi and American cotton for the rain fed and irrigated districts of the Malwa tract respectively.

Promising desi strains were tested for resistance to *Fusarium* wilt.

In work on selection for fertility in interspecific hybrids, progenies from the crosses of *Gossypium arboreum* x *G. Thurberi* doubled x *G. hirsutum* or *G. barbadense* and of *G. hirsutum* x *G. Raimondii* doubled x *G. hirsutum* were selected for futher trial.

Further data on the inheritance of chlorophyll deficiency have revealed that this character is associated with a maternal effect.

Preliminary results suggest that green fuzzy seeds give a significantly higher ginning percentage than white fuzzy seeds.

Continued selection for jassid resistance in a strain of Indore 1 has resulted in reduced ginning percentage.

Work on the genetic modifiers of lintlessness is in progress.

Other crops

Variety trials and selection of wheat, sorghum, linseed, *Cajanus Cajan* and gram are reported. Among the wheat material selected were F_2 progenies of crosses between local Pissi and *Triticum durum* strains. In linseed improvement attention is being given to resistance to *Fusarium* wilt. Varietal trials of potato, sugar cane and groundnut were carried out.

1678.

Plans for Egyptian agriculture.

J. Anglo-Egypt. Chamber Comm. **1950 : 10** : No. 4 : 7–10.

The following new strains recently introduced into Egyptian farming or still under propagation are mentioned: wheat; the rust resistant strain Giza 139 suitable for cultivation in lower Egypt, and Giza 135 for upper Egypt; sorghum; Giza 30 and Giza 35, selected from the American varieties Ajax and Fargo respectively, and Giza 25; rice, selected Yabani [Japanese] 7, Yabani 47 and Agamil, strains with improved yielding ability and blight resistance; cotton, Giza 45, expected to replace Amun, and Giza 31 and Giza 47; sugar,

Co.413, which outyields older varieties by 20%; sesame, Nabatat [Plant] 8 and Nabatat 21; and groundnut, Imported 2/40, producing 28% higher yield than the erect varieties at present available and 14% more than runner types. Maize hybrids have exceeded the average yield of older varieties by 20%; the problem of propagating these hybrids annually to the required extent is under consideration.

1679. Poerck, R. de
Les facteurs de la production végétale dans la culture équatoriale vus sous l'angle de l'amélioration. (**The factors of plant production in the equatorial region, from the angle of improvement**).
Bull. Agric. Congo Belge 1950 : 41 : 879–920.

The problems that arise in regard to plant cultivation and improvement in a country such as the Belgian Congo are discussed with reference to the roles of environmental factors and of various morphological characteristics and physiological functions of the plant.

1680.
Annual Review of the Department of Agriculture, Kenya 1950 : Pp. 82.

Thorpe, H. C. *Sorghum for grain production.* (*pp. 1–3*).

Breeding work on grain sorghum has been started; by hybridization between dwarf introductions and local varieties it is hoped to develop adapted sorghums suitable for combine harvesting.

Gaddum, E. W. *Pyrethrum breeding in Kenya.* (*pp. 4–7*).

Breeding work begun at Njoro during the period 1935–36 resulted in strain 14 x 24, seed of which was first issued in 1941. This strain has improved pyrethrin content, large flowers and upright growth habit, but is recommended for cultivation only at altitudes above 7500 ft.
In 1946 a long term breeding project was initiated, consisting of the following stages: (1) collection and testing single plant selections, on the basis of yield, average flower weight, pyrethrin content, resistance to bud disease and growth habit; (2) crossing desirable selections in isolated plots and growing the seedlings from these crosses; (3) testing the seedlings in yield trials at various altitudes; (4) vegetative propagation of original parent plants forming the most suitable crosses; (5) repetition of stage (2) on a large scale for the production of seed to be issued to growers. A comparatively rapid technique of mass propagation by cuttings is used in stage (4). The time required for the development of a variety by this method of breeding is six to nine years. Distribution of seed of new strains is expected in 1952. The results of a yield trial at two centres in 1949 suggest that the new strains 188 x 194 and 188 x 214 are suitable for cultivation at lower altitudes and that their use might lead to doubling of the pyrethrin yield per acre obtained at present. Work on the development of a strain for growing at the 8000 ft. level and above is in progress.

Storrar, A. and Henderson, G. R. *Notes on investigational work in the Nakuru district and at Ol Joro Orok Experimental Station.* (*pp. 8–11*).

Variety trials on barley, sunflower, linseed, sunflower and soya bean are reported.

Melville, A. R. *Work of the Coffee Research Station and Demonstration Farm, Ruiru.* (*pp. 14–15*).

It is mentioned that the activities of this station include selection and variety trials of coffee.

Jackson, T. H. *Strawberries.* (*pp. 31–33*).

The virus free strain of Royal Sovereign, M40, introduced from England, is giving promising results at the higher altitudes, but has the drawback of being susceptible to leaf spot.

Seedlings of the American hybrids Eleanor Roosevelt x Massey and Eleanor Roosevelt x NG1053 are under selection. Melba has proved unsatisfactory at high altitudes but work on this variety will continue at stations with warmer climates. Hybridization between Royal Sovereign and Melba is planned with a view to developing a variety with the fruit flavour of the former and the disease resistance of the latter.

1681.

Annual Report of the Department of Agriculture, Tanganyika 1948 (1950) : Pp. 173.

Wheat
Trials carried out in the Northern Province on a new series bred for short season conditions have revealed several promising varieties, including 294 B2 A3 which is rust resistant.

Maize
Selections for earliness in Katumbili maize were carried out at the Ukiriguru and Lubaga stations.

Rice
Four strains, which have given consistently high yields during trials at the Mahiwa station, are being multiplied.
Fifteen selections from Kahogo were tested at Ukiriguru for yield and milling qualities; in tests of seven varieties, 2/16, derived from Afaa Kilombero, has shown yields of high quality grain but is inferior to Kahogo.

Sorghum
Yields of six varieties were compared in 1947 and 1948 at the Morogoro Farm.
During the 1948–9 season, selection has continued, at the Ukiriguru and Lubaga stations, for a good quality storing grain having an evenly distributed flinty layer which will resist attacks by weevils. There has been some evidence from studies of the progeny of Feterita SP 24 and D.D. Feterita Hanagil that attractiveness to the stalk borer is inherited.
Data from yield trials of commercially grown varieties are presented. In the extremely dry season most of the late maturing varieties were more seriously affected than those maturing early. Selections for early maturity were made from Dobbs and BC 27.

Potato
Varieties imported from Scotland were tested on the Kungului Farm, Lushoto, Tanga Province, for resistance to late blight. So far, all varieties have been susceptible and another blight strain has been isolated.

Cotton
In the Lake Province, 188 tons of UK 46 cotton seed have been distributed. This variety outyielded MZ 561 at the Lubaga substation. Selection has continued along former lines at Lubaga, but, in addition, resistance to *Pseudomonas malvacearum* is being sought.
Strain testing and selection have continued at the Ilonga station.

Cassava
Varietal trials have been in progress at Morogoro Farm, where three varieties have resisted the brown streak disease. Fourteen mosaic resistant varieties were interplanted with a diseased local variety and observations made at three-monthly intervals are presented in tabular form.

Tobacco
The variety Ehlers, introduced last year, was widely grown in the Southern Highlands Province, and gave high yields. Varietal trials began at Mloa in the Southern Highlands.

Coffee
At the Lyamungu station, Moshi, the lists of selections, from which the clones for propagation are chosen, have been revised. Some of the later plantings in the clonal selection trials have given their first yields; of these N 39 was outstanding in respect of liquoring.
Trials of mother trees and clonal material are progressing in the Northern Province and at the Mbosi substation in the Southern Highlands.

Linseed
Yield trials in the Mbeya and Njombe districts have included the varieties Punjab, Rio and Royal.

Sunflower
At Ukiriguru, selections for size of head and time of maturity were made.

1682.

Annual report of the Field Husbandry Research Section, College of Agriculture and Experiment Station, Potchefstroom 1949-50 (1951) : Pp. 101. (Mimeographed).

A. Plant Breeding. (*Pp. 1–41*).

Wheat
In breeding for wheats improved as regards rust resistance, baking quality and yield, use has been made of the various standard rust resistant parents such as Hope and its derivatives; Kenya wheats; and segregates of crosses and back crosses involving *Triticum Timopheevi* and *Agropyron elongatum* respectively. The results of trials of selections from the breeding material and of varieties are tabulated.

Maize
Breeding work is concentrated upon the production of foundation stocks for hybrid seed of white dent, yellow dent and yellow flint.
In breeding white dent maize attention is being given to the reaction of inbred lines to *Basisporium* ear rot, a disease on the increase; since susceptibility to this rot is correlated with pH of the ear stalk a large number of inbreds are to be analysed with regard to the latter property. A back cross programme has been initiated with the aim of transferring the combining ability of poorly adapted US inbreds to local stocks. Breeding based on the procedure proposed by Robinson *et al.*, known as reciprocal recurrent selection (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 263), has also been undertaken in the white dent type. The results of trials of white dent simple crosses are given; the value of the most promising inbreds for double hybrid combinations is discussed.
Tables list the results of trials on single crosses of yellow dent and yellow flint. The yields of promising double hybrids of yellow dent which have outyielded the best varieties by 25% or more are also indicated.

Sorghum
Advanced generation selections of grain sorghum resistant to witchweed (*Striga lutea*) and bird attack are under trial. A micromethod of determining susceptibility to witchweed is receiving attention.

Lucerne
Work on the development of types adapted to a wide range of environmental conditions is under way. Selections are being made to secure material with favourable growth genes. Drought resistant selections were obtained from the Karoo districts.

Cowpea
Work on the breeding of varieties sufficiently upright to permit cutting with a mower and possessing resistance to leaf spot (*Phyllosticta*) and nematode is in progress. The first results of this programme have been the development of 34 C 361 (Dr. Saunders Upright) in 1934 and 37 C 6 in 1937. Single plant selection of hybrid material and further crosses between varieties and strains were carried out in 1950.

Phaseolus
Breeding work is being carried out to produce improved field beans. The result of trials of 21 common varieties and 15 strains bred at Potchefstroom are summarized.

Groundnut
Information is given on the hybrid progenies selected, including their parentage. In the most recent series of crosses, effected during the period 1946–47, P 1252 x Gudiyatham shows promise of providing several early selections including some with large red kernels. Sufficient quantity of seed of some 30 selections is now available for yield trial.

Soya bean
The breeding programme has as its objective the production of high yielding, non-shattering, yellow-seeded types with satisfactory oil content, adapted to the main maize producing area of the Union. Several crosses between soya beans introduced from the United States and commercial strains have been made; selection of this hybrid material was effected.
The results of trials show that Roanoke and Blyvoor (strain 42 S 6) are the best varieties. Blyvoor, recently named, is a late maturing variety suitable for combine harvesting; it has an oil content of 20·0% and protein content of 38·4%.

Sweet corn
Breeding work has been expanded to meet the requirements of the canning industry. The results of tests of single crosses and varieties are summarized. The best experimental crosses have outyielded the standard hybrids and varieties, with the exception of Stowells Evergreen. The data from the trials reveal that a high yield of unhusked ears does not necessarily mean a correspondingly high yield of first grade, husked ears acceptable to the canning industry. On the basis of productivity and other considerations, it appears that breeding should be directed mainly towards the development of later types.
Susceptibility to rotting organisms in the soil and subsequent poor stands constitute a problem; crosses between the better US lines in respect of germination have been made; these will be subjected to trial in the coming season.
Local stocks of the white open-pollinated variety Stowells Evergreen and introduced seed of the yellow hybrids Brookhaven and Golden Hybrid No. 2439 from the United States are recommended for commercial cultivation.

B. Agronomic Investigations. (*Pp. 42–92*).

The results of varietal trials of maize, grain sorghum, linseed, sunflower, safflower and groundnut are presented.

1683.

Annual Report of the Department of Agriculture, Pretoria for the year ended 31 August, 1950.
Fmg S. Afr. 1950 : **25** : 379–504.

Wheat
Breeding at the Stellenbosch-Elsenburg College of Agriculture includes the following: analysis of the merits of mass selection only under variable seasonal conditions; use of wheat-*Agropyron* material as a source of disease resistance; reaction of breeding lines to local forms of rust and other diseases; study of types from the chief ecological regions possessing outstanding agronomic characters, prior to their use in a new series of crosses.

Oats and Barley
Established varieties and breeding strains were maintained at the Stellenbosch-Elsenburg College.

Rye
Polycrosses of pure strains with existing varieties are being tested.

Maize
Trials at the Barberton Station demonstrated the superior streak virus resistance of the local strain P x H, the high yielding capacity of a hybrid from inbred lines, and the fact that top crosses appeared to have better combining ability with certain standard varieties than with others. Breeding for streak resistance received attention at the Central Tobacco Station, Rustenburg.
In work on the production of hybrid maize at the Potchefstroom College of Agriculture, only a relatively small number of inbred lines have so far been found entirely suitable as parents; the production of top-crossed seed from certain open-pollinated varieties has therefore been necessary.

At the Agricultural Research Institute, Pretoria, progress has been made on the selection of strains resistant to streak virus and in the development of inbred lines for hybrid production.
Hybrid production is receiving attention at the Natal Agricultural Research Institute; resistance to streak and white blight is also being sought.

Sorghum
Witchweed resistant dwarf types suitable for combine harvesting are required; high yielding, witchweed resistant lines suitable for crossing with the best dwarf forms have been selected at the Potchefstroom College of Agriculture.

Forage grasses and legumes
In the collection at the Rietvlei Agricultural Research Station certain strains of *Ehrharta calycina* are of particular interest; they are capable of providing green grazing under unirrigated conditions in the high veld during both winter and summer.
Progenies of selected plants of *Setaria sphacelata* have been studied with regard to seed yield, forage yield, percentage of desirable plant types, variability of forage and seed yield, and correlation between open fertility and total seed yield at Potchefstroom. Certain *Pennisetum purpureum* x *P. typhoides* selections are especially promising; they appear to be perennial and to possess high yielding capacity.
Strains of seradella and lupin introduced from Germany are under test at the Glen College of Agriculture, OFS. In lupin selection and breeding at the Stellenbosch-Elsenburg College, alkaloid deficiency, softness of testa and other characters are receiving attention. Selection of wild vetches with soft testas continued.
A lucerne ecotype well adapted to the Western Cape Province is being sought. Selections have therefore been obtained from established lucerne which had been severely reduced by natural selection. These will be tested for self and cross fertility with a view to developing an improved type by the polycross method.
Gleditschia shows considerable promise as a fodder tree; the main problem being tackled at the Grootfontein College of Agriculture is the development of dependable heavy bearing trees with satisfactory pod quality.

Potato
Breeding work has been initiated at the Bethlehem Agricultural Research Station to develop improved varieties for the high veld. Material produced by the Division of Botany and Plant Pathology is undergoing further selection at the Dohne Station for disease resistance and adaptation to the sour grass veld areas.

Cotton
The Barberton Station was transferred from the Empire Cotton Growing Corporation in September, 1949. Many progenies of MV 8 x BP 52 yielded as well as variety A 2106, which in previous tests had yielded consistently better than all other varieties and strains. As in previous trials, progenies of U 4 and Sea Island gave poor yields.

Hibiscus
Promising types of *H. cannabinus* and *H. Sabdariffa* were selected at Barberton.

Tobacco
Greater production of the Orinoco type is essential for export. In tests during recent years at the Central Tobacco Research Station, Rustenburg, the Orinoco group has produced better quality tobacco than the Amarelo type but has been outyielded by the latter.

Fruits and nuts
A citrus collection is maintained at the Nelspruit Research Station, providing material for breeding. Variety collections of avocado, mango, litchi, pecan, banana and other tropical and subtropical fruits have also been established and are to be used in connexion with breeding. Progress has been made in payaya breeding, aimed at developing a high quality type which produces a higher proportion of female to male trees.
New peach crosses have been made at the Western Province Fruit Research Station, Stellenbosch, to develop improved early white-fleshed varieties for dessert, resistant to delayed foliation. From older crosses promising canning types have been secured. A large number of crosses have been effected with the aim of breeding a pear of the Bon

Chrétien type with improved keeping quality. Grape hybrids are being studied. Guava hybrids are undergoing further tests, particularly for canning quality. Additional strawberry crosses have been made; varieties have been introduced from the USA for use as parents.

Groundnut varieties tested at Potchefstroom have now been classified and their yielding capacities assessed. Strains belonging to the Natal Common Group have given the best performance under unirrigated conditions; to meet the recent demand for a large kernelled groundnut, Egyptian Giant has been recommended for cultivation under irrigation. Breeding work may shortly result in early maturing large kernelled strains.

Vegetables

Tomato breeding for resistance to spotted wilt virus is being carried out by the Division of Horticulture, using crosses of *Lycopersicon esculentum* with *L. pimpinellifolium* and *L. peruvianum*. Resistance to *Fusarium* wilt, eelworm and *Septoria* leaf spot is also receiving attention. F_1 hybrids have given increases of yield ranging from 25 to 30%. The possibility of maintaining hybrid vigour in the F_2 is being investigated.

In cabbage breeding, combination of the following characters is the objective: early maturity, average head weight of 3 to 5 lb., hard heads with small stems and resistance to bacterial black rot and mildew. Improved lines of Cape spitskool are being crossed in the hope of combining bolting resistance, good type of head, uniformity and earliness.

Inbred lines of the carrot Cape Market, improved with regard to bolting resistance and quality, have been combined and are now being tested for yield. Combinations of improved inbreds of the beetroot Detroit Dark Red are also under trial.

Selection of the onion Texas Grano for uniformity continued. An early strain of this variety has been developed.

It is mentioned that breeding is also being carried out on sweet chilli, egg plant, peas, beans and other vegetables.

Cowpea hybridization has been effected between cultivated and wild types at the Natal Agricultural Experiment Institute.

Soya bean

Increasing attention is being given to soya beans at the Potchefstroom College of Agriculture; an outstanding characteristic of the crop is its ability to resume flowering and seed production after protracted droughts. A large number of strains are to be tested; commercial quantities of seed of Blyvoor are now available. Further hybridization has been carried out at the Natal Agricultural Research Institute.

1684.

Annual Report of the Department of Agriculture, Northern Rhodesia for the year 1949 (1950) : Pp. 19.

Wheat

The late maturing varieties Karachi and Mentana, certain South African selections, Matopo and selected Red Klein showed promise in trials at the Lusaka Farm. Punjab 8A did not give such a good performance as usual but is still recommended for rust free areas. Several new wheats were tested for the first time at Lunzuwa, Northern province.

Maize

Hickory King was outyielded by double hybrid maize under conditions of prolonged drought at the Lusaka Farm.

Kaffir corn

Selection is in progress at Lunzuwa.

Tobacco

Trials of the Virginia varieties Jamaica Wrapper, White Stem Orinoco and C/7, and of Turkish types were carried out at the Mochipapa Tobacco Station, Choma; results were inconclusive. At the Meskera Tobacco Station, Fort Jameson, Willow Leaf was less affected by drought than the other Virginian tobaccos tested. Of the American burley varieties studied at Petauke, White Burley, KY 16 and Barnet Special gave better samples than KY 41 and Harrow Velvet.

1685.

Report of the Department of Agriculture, Nyasaland Protectorate for the year, 1948. Part II. Experimental work. Pp. 15.

Progress has been made with varietal trials of wheat, rice, onion, tomato and beans.

Tobacco

Yellow Mammoth has given superior yields at the Kasungu station; samples are reported to be generally acceptable for English markets.

Tung

At the Cholo Experiment Station a trial comparing unselected seedlings from bulk seed, selected open-pollinated seedlings from four high yielding mother trees, buddings from these four trees on *Aleurites montana* seedling stocks and buddings from the same source on *A. Fordii* was carried out. Over a period of five years, the buddings on *A. montana* stocks have given the highest yields. Yield variations in these grafted clones were observed; ZM 13 has proved consistently superior. Other trials of newly developed clones are being continued.

1686.

Report of the Minister of Agriculture for Canada for the year ended March 31, 1950 : Pp. 287.

Spring wheat

Many of the new hybrid strains tested at Winnipeg outyielded all the standard varieties, largely because of improved leaf rust resistance. RL 2265 has formed an important source of leaf rust resistance; Redman has been frequently used in back crosses to improve yield and quality. Two new strains of durum wheat, RL 3047 and RL 3048, combine shortness and strength of straw, good yielding capacity, disease resistance and quality; they are being widely tested in Manitoba.

Work on breeding early maturing wheats, formerly conducted at Ottawa, has now been transferred to the Lacombe Experiment Station, Alta.

Cytogenetical investigation of sawfly resistant wheats is aiding breeding work on resistance to this pest; progress is being made in producing a more resistant variety than Rescue (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 1053), with improved quality.

A procedure for the genetical analysis of characters showing a complex mode of inheritance, such as protein and carotene content, dough strength, seed dormancy and frost resistance of seedlings, has been established.

Study of the inheritance of disease resistance, earliness and other characters, and the association of these with a particular chromosome, is to be carried out; reciprocal transfers of chromosome aberrants of Chinese with Saunders and Cascade are to be made.

Information is given on the status of the recently distributed wheats Cascade (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 1479), Redman (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 17), Rescue (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 1053) and Saunders (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1401).

The introduced wheats Equator II and the Australian hybrid 184 P 2A1F combined resistance to all 22 physiological races of leaf rust in tests at Ottawa; this material should be particularly valuable in future breeding.

The chief results of milling and baking tests of hard red spring wheats conducted at the Grain Research Laboratory, Winnipeg, are summarized (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2244).

Seedling resistance to *Helminthosporium sativum* differs widely with variety; resistance appears to depend partly upon the relative abundance of the antibiotic bacterial flora on the seeds.

Catalase tests may prove to be fairly reliable for the laboratory determination of resistance of hybrid lines to root rot, high catalase activity being associated with high degree of resistance.

Selfing studies with physiological races of leaf rust revealed that some races are homozygous for pathogenic properties, whereas others are heterozygous.

Experiments on the sexuality of the cereal smuts have been continued with a view to determining the genetic relationship between smut species and the possible origin of new physiological races through hybridization.

Winter wheat

Breeding work has been begun at the Lethbridge station, Alta.

Introduced to farmers in Ontario during 1946, Cornell 595 was used for more than half the acreage of winter wheat sown in 1949.

Tests of the quality of winter wheats grown at 10 different locations in Ontario were carried out at the Grain Research Laboratory; the soft red variety Fairfield was recommended for licensing.

Buckwheat

Differences between selections in rutin content during two years were not uniform enough to form the basis of selection; further work is required.

Oats

All hybrid populations tested at Ottawa were resistant to Victoria blight. Newer selections exhibited smut resistance. Hybrid strains, bred especially for lodging resistance, were used as parent material in crosses with disease resistant lines. Parent stocks have been synthesized for use in breeding varieties with increased resistance to crown rust; some of these, carrying the combined crown rust resistance of Victoria and Bond, have already been used in crosses from which lines possessing resistance to all the important races of crown rust and to Victoria blight have been selected. In 1949, selections having combined resistance to all common races of crown and stem rust and to smuts and Victoria blight were made at Ottawa and Winnipeg. The inheritance of reaction to certain races of rust and to other diseases is being investigated at Winnipeg.

As a consequence of the recent incidence of crown rust on Bond and Clinton, due to races 34, 35 and 57, the varieties Landhafer, Santa Fe and Trispernia are now being used as sources of resistance to this disease.

The new varieties OT 128 and OT 130, both from the cross RL 1574 x Roxton, showed satisfactory resistance to an artificial epidemic of halo blight in the field.

Stem diameter, root type and plant height are the most important characters affecting resistance to lodging, in order of decreasing importance. Varietal differences in these characters were maintained under all environmental conditions.

A study of the extent to which varieties differ in growth rate of the panicle primordia in relation to varietal maturity and time of seeding has begun; preliminary results indicated that the rate of development of the young panicle is not always directly associated with date of maturity and that it may be also influenced by factors such as day length. Investigation of internal plant development may lead to valuable information on the problem of why some varieties are adapted to particular environments.

Germination tests on artificially frosted grain at three different stages of maturity were carried out on Ajax, Beaver and Victory; the last named variety, a medium late maturing oat, was more resistant to frost in the early dough stage than Ajax, an early maturing variety; Beaver was intermediate between the other two varieties.

Variety was found to be an important factor affecting protein and fat content; chemical composition should therefore be studied in addition to yielding ability and disease resistance in selection. Locality was found to be a factor of equal importance to variety; season exerted much less effect.

Maize

The following new hybrids were recently licensed: Morden 75, Morden 77, Harvic 482, Harvic 485, Canbred 210, Canbred 220 and Canbred 230. They are recommended for grain production, with the exception of Harvic 482, which is particularly suitable for silage.

Data from tests made at Ottawa in two seasons appear to support the general belief that grain from hybrid maize tends to be somewhat lower in protein content than grain from open-pollinated varieties. An analysis is now being made of the protein content of inbred lines entering into the production of hybrids; it is hoped that by combining lines high in

protein content hybrids equalling or exceeding open-pollinated maize in protein content will be secured.
Stage of maturity exerted an important effect upon the sugar percentage of silage in both hybrids and open-pollinated varieties; the percentage was lowest in the earliest and highest in the latest maizes. No significant difference in sugar percentage of silage was found between hybrids and open-pollinated varieties of similar maturity.

Barley
Incorporation of resistance to loose smut, lodging and mildew in the desirable malting and fodder varieties now being grown is an immediate objective of breeding. Ultimately it is hoped that resistance to semi-loose smut, covered smut and leaf and stem rust will also be incorporated. The agronomically desirable varieties Montcalm and 3092 A (Velvet x Olli x OAC 21) have been crossed with disease resistant varieties and hybrids. The world barley collection has provided several good sources of resistance to mildew. Much use is being made of the back-crossing technique to improve the disease and lodging resistance of standard barleys. At a more advanced stage of breeding, selections having combined disease resistance will be intercrossed to obtain as many desirable characters as possible in a single variety.
The production of malting and fodder barleys, for the irrigated and dry areas of Canada, forms an important project. Extensive cooperative testing of new unnamed hybrids from Canada and the United States in comparison with Canadian standard varieties is in progress.
Compana and Velvon II from the United States and Ottawa 3092 A were licensed for sale. The latter is a smooth awned, six-rowed barley with straw strength above the average; it is resistant to loose smut and appears to have moderate resistance to stem rust and common root rot at Ottawa; it may also possess some degree of resistance to net blotch, scald and bacterial blight.

Grasses
Meiosis was studied in 14 artificial intervarietal hybrids of *Agropyron trachycaulum*. All the F_1 hybrids showed slight to frequent meiotic irregularities; degree of irregularity was not correlated with varietal combination. F_2 plants were more regular in meiosis and more fertile than the corresponding F_1 plants from which they had been derived by selfing.
Analysis of morphological variation in this species indicates that variation in a number of characters of potential taxonomic value is not in agreement with existing classifications.
Chromosome numbers of grass collections from northern Canada, Newfoundland and South America have been determined.
A promising tall fescue strain, developed at Ottawa and designated 39, has outyielded Alta, a strain used widely in the United States; the new strain is being increased for further testing.
In tests of bent grass strains for turf, Congressional from the United States has shown superiority to other strains, including resistance to snow mould, earliness of spring growth, bright green colour and ability to retain this colour late in autumn.

Lucerne
The importance of wild bees in tripping and cross-pollinating flowers and thus in the seed production of this crop has been demonstrated; the common honey bee was found to be largely ineffective.
Lines producing as much as double the amount of seed of standard varieties and also high forage yields have been selected at Saskatoon.
Breeding material highly resistant or immune to bacterial wilt has been isolated and is now being evaluated for general agronomic characters.
Only a few plants show resistance to winter crown rot and these are often undesirable as regards seed and forage production. Intercrossing of resistant plants and outcrossing to plants possessing good agronomic characters have however yielded encouraging results.
Progress has been made in the production of a suitable creeping-rooted type for the dry regions of western Canada. Crosses between creeping rooted selections of *Medicago falcata* and standard varieties have provided lines in which the character creeping root is now well

established; some of these lines also produce good yields of forage and a fair amount of seed.

Sweet clover
Selection for low coumarin content is in progress.

Field beans
The new variety 2562 A has been licensed under the name Clipper; seed has been distributed in western Ontario. It matures several days earlier than Michelite, and produces a vigorous upright growth, with the pods placed high up on the haulm. Tests of resistance to anthracnose, common and halo blight continued. Valuable blight resistant lines were selected from the crosses Michelite x CD 3623 and Corvette x CD 2612.

Potato
Of the seedlings developed at Fredericton, New Brunswick, F 391 and F 431 have shown promising late blight resistance and are to be named and distributed.
Further progress in determining the late blight, ring rot and common scab resistance of seedlings developed at Fredericton is reported. Two seedlings exhibited resistance to both late blight and ring rot; 186 seedlings gave promise of satisfactory resistance to scab. Varietal testing for resistance to *Verticillium* wilt, *Fusarium* storage rot and blackleg has been started at Charlotte Town, Prince Edward Island. Houma showed a high degree of resistance to *Verticillium* wilt.

Flax and linseed
A new race of rust has attacked the American variety Dakota (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1248) and certain hybrid families in the breeding material. Tests of selections and introductions for pasmo resistance continued. A few fibre flaxes from the Netherlands have exhibited more tolerance of this disease than other varieties studied. Work on the development of fibre flax lines with resistance to rust and wilt continued. Several hybrid lines were tested for disease resistance and fibre quality. Foundation stocks of Liral Prince, Stormont Cirrus and Stormont Gossamer L 26 were produced.
Flax has been added to the crops handled at the Laboratory of Cereal Breeding, Winnipeg. Resistance to disease is to be investigated and particular attention is to be given to pasmo and its relation to quality and agronomic characters.

Tobacco
At Ottawa the development of cigar tobacco varieties resistant to mosaic virus and black root rot received considerable attention. Three strains of Connecticut Havana 38 have exhibited superiority in yield and crop returns over the parent tobacco; two strains of Connecticut Broadleaf outyielded the parental variety by 450 lb. of cured leaf per acre. Promising cigar tobacco lines possessing resistance to mosaic have been selected. Success in incorporating mosaic resistance in popular varieties of flue cured, dark and burley types is also being achieved.
Breeding for resistance to black and brown root rot in burley, dark and flue cured types is centred at Harrow.
The new flue cured variety Delcrest is providing good commercial results (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 1747). The new burley strain 37003, resistant to both root rots, is to be released. Developed from a cross between Harrow Velvet and Green Briar, this tobacco is slightly higher yielding than Harrow Velvet and comparable in quality. The new dark strain 5058, grown on a small commercial scale in 1949, compares favourably with Little Crittenden and Greenwood in yield and quality and is moderately resistant to black root rot.

Sunflower
Further progress in sunflower seed production in western Canada is largely dependent upon the production of disease resistant varieties giving high yields of seeds and oil. Breeding work at Morden, Man., is now concentrated upon the development of rust resistant types.

Tree fruits
The new black cherry Star and peach Solo, bred at Summerland, BC, were named and introduced in 1949. Star is suitable for both the fresh fruit market and canning industry,

and ripens earlier than Bing. Solo, a yellow fleshed peach, has good dessert and canning quality. It has approximately the same ripening season as Veteran and an exceptionally long picking range.

Raspberry
The new hybrid raspberries Tweed, Trent, Muskoka and Madawaska developed by the Division of Horticulture have shown superiority in yield over standard varieties during a five-year cropping period (cf. Abst. 881). Muskoka is the hardiest variety fruiting at Ottawa and has given a good response to winter conditions in the Prairie Provinces.

Currants
The recently released rust resistant black currants Crusader and Coronet (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 1270) have been found to be incapable of pollinating each other. These varieties are not incompatible since fruit is formed as a result of hand pollination. The pollen of Crusader tends to stick together in clumps and the bees do not readily pick it up. The flowers of Coronet do not open widely at the top; bees frequently reach in from the side of the flower and then do not come into contact with the anthers. A third rust resistant selection, O–396, gives fruit set in both Crusader and Coronet and is able to pollinate itself without the aid of insects. It is at least equal to Crusader and Coronet in yield and other characters; it is being multiplied as rapidly as possible.
Breeding for resistance to rust and aphids is in progress with red currants. Viking and the wild species *Ribes diacantha* are among the parents used. One seedling from Viking x Stephens 9 has been selected for further trial; it is completely resistant to rust and highly resistant to aphids.

Gooseberry
The thornless variety 0–272 has been named Captivator. It produces high yields of good quality berries, red when ripe and equal in size to those of Poorman. Five other selections of the same type have been introduced for trial.

Strawberry
Varieties and new introductions are being indexed for virus diseases. A programme for the production of virus free stocks has been initiated at Fredericton.
Yellows has become a serious problem in the cultivation of Marshall in the Pacific Northwest. British Sovereign has not been seriously affected; whether this is due to natural tolerance or mere escape from the disease up to the present time is not known.

Cabbage
Selection of Golden Acre has resulted in the new strain Canadian Acre. The advantages of the new strain are its earliness, uniformity and small compact heads.

Cucumber
Extensive trials are now being conducted at Charlottetown to determine the most suitable varieties for the production of pickling cucumbers. Model has exhibited superiority in yield over Chicago Pickle, at present the standard variety; tests are being carried out to evaluate its flavour and quality when processed.

Tomato
The new variety Monarch is an F_1 hybrid between selected strains of Early Chatham and Bounty. Another new tomato, Meteor, originated from the cross L–3700 x Bonton, backcrossed three times to Bonton. Lethbridge 3700 Sel. III has shown particular promise as a canning variety but is still not early enough.

Pea
Laxall shows promise for the Prairie Provinces (Abst. 881). Kostenay entered the seed trade in 1949 and should prove valuable in the Maritime Provinces (cf. Abst. 881). Tiny Tim, a dwarf plant mutant selected from the cross Wisconsin Early Sweet x Engress, has been introduced by the Morden station.

Sweet corn
The F_1 hybrid Sugar Prince, developed at Morden, has exhibited particular promise as an early variety (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 1339); it is the result of a cross between Filer Sunshine and Burbank Bantam.

1687.

Report of the Federal Experiment Station in Puerto Rico, 1950.
Bull. P.R. [Fed.] Agric. Exp. Sta. 1950 : Pp. 30.

Insecticides
A recent study of introductions of the Sarawak Creeping variety of *Derris elliptica* revealed wide variation in rotenone content; it is thought that several clones may be present in the population. Eight plants with rotenone content ranging from 8·3 to 10·6% have been obtained.
During experiments to isolate possible precursors of rotenone in *D. elliptica*, it was noted that in six months old roots of the variety Changi III MG the rotenone content was 4·8% but Sarawak Creeping plants required up to 14 months to form an equivalent amount.
Cuttings of *Lonchocarpus* sp. and clones of the variety Changi III MG of *D. elliptica* propagate equally well during the season of heavy rainfall regardless of the date of planting; Sarawak Creeping cuttings, of *D. elliptica*, were influenced by the planting date and did not survive when propagated in August.

Forage grasses
The percentage viability of seeds in the varieties Gramalote, Broad-leaf, Fine-leaf, Regular and Borinquen of *Panicum maximum* and of *P. purpurascens* is reported. A tendency to shed inviable seeds at an early date was noted in all varieties of *P. maximum*; it is suggested that delay in seed harvesting would allow seeds to reach maturity with a negligible loss of early maturing viable seeds.
Analyses of variance made for ten characters in the five varieties of *P. maximum* show that the differences between the varieties are highly significant. No intervarietal hybrids were observed although the plants used in the trial were the result of open pollination. In conjunction with the uniformity within each variety this suggests an asexual method of reproduction.
Cytological studies of the Borinquen variety of *P. maximum* have revealed the presence of tetraploid ($2n = 32$) and hexaploid ($2n = 48$) forms which are morphologically indistinguishable. Those forms with 32 chromosomes are autotetraploids with various combinations of univalent, bivalent, trivalent and quadrivalent associations at meiosis, whereas in the hexaploid forms associations of six chromosomes occur with an accompanying increase in chromosomal non-disjunction and abnormality.
The hexaploid apparently arose as a mutation in the test plot at Mayagüez, where both forms were found growing together.

Bamboo
A comparison of the susceptibility of *Bambusa longispiculata* and *B. vulgaris* to *Dinoderus minutus* has revealed an average of 5·8 and 21·7 attacks per test portion, respectively, representing five different ages of both bamboo species.
Carbohydrate analyses of *B. vulgaris*, *B. longispiculata*, *B. polymorpha*, *Dendrocalamus strictus* and *Sinocalamus Oldhamii* show that the starch content varies with the species. Intensity of reaction to the iodine spot test is a dependable indication of the concentration of starch in all species and is correlated with degree of infestation by *Dinoderus minutus*.
Clumps of *B. Tulda*, *B. tuldoides*, *B. longispiculata*, *B. textilis*, *Dendrocalamus asper*, *D. strictus* amd *Sinocalamus Oldhamii* which were each fertilized annually showed a consistent growth increase in all species except *B. longispiculata*; *B. Tulda* and *S. Oldhamii* gave the maximum response.

Forage legumes
Comparative trials have continued with numerous species and varieties of native and introduced legumes. Further studies with promising types are concerned with (1) adaptability to high elevations, (2) toxicity and palatability and (3) evaluation of other characters of possible value in a breeding programme.
Two plants of a hairless mutant of *Pueraria* bred true for the hairless character after self pollination. When they were crossed as male parents with normal hairy plants all the offspring had intermediate hairiness, indicating that the hairless character is determined by incompletely recessive factors.

Disparity in the rate of germination of *Stizolobium* species and hybrids has been effectively controlled by immersion in 50% sulphuric acid for 12–20 mins. followed by thorough washing before planting.

Sweet potato

Four additional Jersey varieties, Red Jersey, Vineland Bush, Big Stem Jersey and Jersey Orange have been induced to flower at Mayagüez. They have been crossed (1) among themselves, (2) with the three other varieties already flowering, Orange Little Stem, Maryland Golden and Yellow Jersey, and (3) with moist-fleshed varieties resistant to *Fusarium* wilt, PI 153655, PI 153907, L 138 and Unit IPR; numerous seeds have been obtained. Seed set percentages and the relative fertility of the varieties as male or female parents are recorded.

The results of greenhouse tests for *Fusarium* wilt resistance, at Beltsville, indicate that the characteristic can be transferred from the moist-fleshed types to their Jersey hybrids.

Coffee

The difference in yield of the Columnaris and Puerto Rico varieties was not significant in the sixteenth year of comparison, although the average yield for the sixteen years has been 10·74 and 5·94 cwt. per acre, respectively.

Vanilla

Vanilla phaeantha has shown highest resistance to *Fusarium Batatatis* var. *Vanillae* in comparative trials of four species; although this species has little economic value it may be used as a source of resistance in attempts to develop resistant hybrids of *V. fragrans*.

Rubber

Possible explanations for the low fertility of *Hevea brasiliensis* are being sought. When the fruit sets, which is rarely, all three ovules within the ovary develop normally and show none of the characteristics associated with chromosomal aberrations. Cytological studies of meiosis in the anther indicate the regular pairing of 18 bivalents so that phenomena other than cytological irregularities are probably responsible for the sterility.

Variations in the number of pollen grains observed on the stigmas suggest that inadequate pollination may be a controlling factor. Thrips and chironomid midges are frequent visitors of female flowers of *Hevea* at Mayagüez but their relative importance in effecting self and cross pollination is uncertain.

Papaya

Vigorous F_1 hybrids have been obtained from *Carica Goudotiana* ♀ x *C. monoica* ♂; they resemble the female parent in having a light yellow coloured fruit, and the male in having oval fruits, a low branching stem and a monecious habit. Although the hybrid fruits contain many sterile seeds, some are fertile and an F_2 generation is being grown.

Attempts are being made to combine the apparent resistance of *C. quercifolia*, an unidentified *Carica* sp. and *Jacaratia Hassleriana* to bunchy top disease with the commercially desirable characteristics of *C. Papaya* by hybridization.

Tomato

The results of trials of standard varieties and new strains are reported. The recently introduced STEP 68 and 89 were superior to other introductions.

Sweet corn

A few crosses were made between inbred F_1 populations of USDA 34 and inbred lines from Connecticut; the latter grew weakly under Puerto Rican conditions.

1688. Koopman, C.
Plantenveredeling in de Verenigde Staten. (**Plant breeding in United States**).
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) 17 February, 1949 Wageningen : 261–67. (Mimeographed).

Plant breeding in the United States is surveyed as a result of a visit during 1948; reference is made chiefly to wheat, maize, grasses and clover, potato and sugar beet.

1689.

Oregon's agricultural progress through research.
Rep. Ore. Agric. Exp. Sta. 1950 : Bull. No. 491 : Pp. 165.

Cereals
Breeding is in progress to develop high yielding disease resistant varieties of wheat, oats and barley. The recently released spring barley, Bonneville, shows considerable promise in the Snake River Valley region (cf. Abst. 1851). It is a late maturing, stiff strawed selection of Coast-Lion-Trebi x Winter Club.
In trials of experimental and commercial maize hybrids, W–412–A was the only new hybrid which significantly outyielded Oregon 525, the standard in the Willamette Valley.

Tall fescue
Breeding work has begun. In a preliminary investigation of breeding behaviour, most plants tended to be highly self sterile. Some highly self fertile plants were however obtained; these will be used for studies on inbreeding. Resistance to *Helminthosporium dictyoides* and *Rhizoctonia Solani* requires attention.

Forage legumes
The smooth form and common or fuzzy type of big trefoil (*Lotus major*) have been named Columbia and Beaver respectively.
The lucerne Talent is showing outstandingly high forage yields and adaptability in southern Oregon (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2178).

Potato
Kennebec and Russet Sebago exhibited promising resistance to late blight; they may prove suitable for commercial cultivation.

Flax
Improvement work is being conducted in cooperation with the US Department of Agriculture. Over 200 varieties and strains were tested for straw and fibre yield, disease resistance and fibre quality; many strains were introduced from foreign countries for observation.

Phormium
Ph. tenax is under investigation as a possible new crop.

Hops
Downy mildew resistance and improved quality are among the aims of breeding.

Nuts and tree fruits
Extensive variety trials are in progress. The following bud sports are under observation: a form of the peach Early Elberta ripening 10 to 14 days earlier than the parent variety; four seedling peaches apparently resistant to leaf curl; an apple seedling of the Winesap type which ripens in early September; and a self-husking type of black walnut. A collection of 300 cherry varieties is established at the central station. Cherry varieties are being tested for resistance to albino; the cause of this disorder is also being investigated. Several promising hybrid pears are under observation; sib-crossing was effected between two seedlings from the cross Comice x Farmingdale in an attempt to combine the desired qualities of both parents in a single individual. Wild plum seedlings are being selected.

Small fruits
The blackberry Olallie was introduced (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2610). In canning and freezing tests the blackberry selection 742 (Pacific x Boysen) gave promising results. Varieties more suitable for canning and freezing are required by the trailing blackberry industry; chromosome counts were made on 20 varieties as the first steps in breeding to solve this problem. The red raspberry selection 549 showed promise for freezing. Eight strawberry selections were rated as equal or superior to the standard variety Marshall with respect to freezing quality. Eleven selections exhibited resistance to red core. In preliminary tests some new blueberry selections produced by the US Department of Agriculture gave a superior performance to varieties now in use. The results of trials led to the addition of Pemberton to the blueberries recommended for commercial growing.

Vegetables
An extensive programme of improvement of several vegetables has been initiated.

1690.

Sixty-second Annual Report of the College of Agriculture at Cornell University and of the Cornell University Agricultural Experiment Station 1949 : Pp. 215.

Whea
Hybrids from Honour wheat and Rosen rye, after back-crossing with both parents, are being selected for disease resistance and other characters. Selection for resistance to common bunt, dwarf bunt and leaf and stem rusts continues.
A new smut resistant hybrid from a cross between Yorkwin and the smut resistant strain No. 2 has a higher yield than Yorkwin.
Varieties of wheat resistant to *Tilletia caries* are being developed and tested.

Oats
High yielding, smut resistant hybrids have been obtained, using the resistant variety Goldwin. Progress has been made in obtaining seedlings, which are resistant to *Puccinia coronata* and *Helminthosporium Victoriae*, from several varieties of Victoria parentage.

Maize
Methods of studying the inheritance of kernel row number were devised.
New varieties are being developed for silage.
More *Tripsacum*-maize hybrids were obtained by crossing tetraploid *T. dactyloides* with diploid maize, than when diploid *Tripsacum* was used. Similar trials in Mexico failed to produce any hybrids. The results of back-crossing these hybrids with maize indicate that certain *Tripsacum* chromosomes alter the appearance of maize plants.

Barley
Progress continues in breeding varieties resistant to smut and mildew.
Three new varieties of winter barley show greater hardiness and give higher yields than Wong, with straw of equal stiffness.

Forage grasses
Selection of brome grass is under way. Greater resistance to brown leaf spot is shown by southern varieties than by those from northern areas.

Leguminous forage crops
Selection of lucerne is in progress, northern types being generally preferable. *Lotus corniculatus* strains from throughout the world are being investigated to isolate ecotypes suited to New York conditions, and promising strains with high yields are being developed. Thirty varieties of red clover were tested for resistance to clover root borer, but none was significantly resistant.

Potato
The survey of species and varieties for resistance to specific diseases continues. Tetraploid forms of wild species of *Solanum* have been crossed with *S. tuberosum* to obtain insect resistant hybrids. The wild *S. demissum*, immune to *Phytophthora infestans*, has been back-crossed with domestic varieties, producing twelve new types with good yields. These back crosses have indicated that at least three genes are necessary for blight immunity. Breeding work continues for leaf roll and scab resistance.

Apple
Investigations on the basal metabolic rate of several apple varieties have continued.

Cucumber
Further mosaic-resistant varieties of pickling cucumbers are being sought. Yorkstate Pickling, derived from (Chinese Long x Early Russian) x National Pickling, has proved resistant and generally acceptable.

Tomato
Selections from a cross between Earliana and Valiant have produced a true breeding variety with a round fruit. Slightly smaller fruits of improved colour have been obtained in the

selection 47–57 from Michigan 4502 x Rutgers. Tests have continued for earlier ripening in several varieties.
An increased resistance to cracking is associated with development of fruit containing many loculi.

1691. Lewis, R. D.
Agricultural Research in Texas, 1947–49.
Tex. Agric. Exp. Sta. 1949 : Pp. 201.

Varietal adaptability trials are reported for sweet corn, cantaloupe, cucumber, water melon and Lima bean at several experiment stations.

Wheat
Additional information concerning the parentage of Quanah (cf. Abst. 973) is reported; this new variety was developed from the complex cross (Mediterranean–Hope x Comanche) x (Comanche x Honor–Forward).

Oats
A new winter hardy variety suitable for northern and central Texas, named Mustang, is one of the results of efforts to develop oats resistant to low temperatures. It yields well from spring sowing in northern and central areas and from autumn sowings throughout Texas. Although Mustang is resistant to crown rust, it is susceptible to stem rust and moderately susceptible to *Helminthosporium* blight. Greater disease resistance is being sought in conjunction with winter hardiness.

Sorghum
The inheritance of plant height, length of peduncle, date of maturity and male sterility is being investigated. Breeding work is continuing; new varieties reported include Combine Kafir 60, Redbine 60 and 66 (cf. Abst. 343).

Maize
Yield trials of new hybrids are being conducted at widely scattered locations. Texas 24 (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 272), 26 and 28 (cf. Abst. 1002) have shown yield increases of 5–10% over all other hybrids now available in Texas.

Barley
Improvement work to develop varieties adapted to the various climatic conditions of Texas has continued. Two new and as yet unnamed strains, No. 8–43–311 and selection 119, developed for growing in the central and southern regions respectively, have shown promise.

Rice
The Beaumont station has produced Century Patna, an early maturing, long, slender grain variety from Texas Patna x (Rexoro x Blue Rose). A series of early, mid season and late maturing types is being sought.

Forage grasses
Additional information concerning the sorghum Hi-Hegari (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2369) reveals that it was developed by crossing a tall mutation in Early Hegari with Hegari and selecting the recombination of tall stalk with Hegari maturity.
Varietal trials of several grasses have been conducted in widely scattered localities.
Investigations of the progeny of individual plants of Yellow beard grass indicate that the species is apomictic.

Forage legumes
Yield trials of many varieties of lucerne, *Medicago*, hairy vetch, sweet clover and crimson clover have been carried out at different stations.

Cotton
Specimens representing the range of variability of all the major groups of native *Gossypium* species are being sought to complete the collection at College Station; each type is being evaluated for agronomic characters and resistance to disease, insects and drought.
A new interspecific hybrid combining *G. Harknessii* with Asiatic and American cultivated species has been obtained; its chromosome constitution resembles that of the *G. Thurberi*

hybrid which was derived by doubling the chromosome number of the first generation hybrid of *G. arboreum* x *G. Thurberi* and crossing this with the natural *G. Harknessii* amphidiploid. The new hybrid was also obtained by crossing *G. Harknessii* with a colchicine induced hexaploid form, derived from the F_1 of *G. hirsutum* x *G. arboreum*. Attempts to cross *G. Harknessii* with *G. arboreum* failed, but the $(AD)_1$, A_2 and D_2 genomes are brought together in the above hybrid successfully. Desirable characters, such as the small bracteole and smooth entire leaf which reduce the percentage of waste in the lint, are being recovered by back-crossing the new hybrid with cultivated varieties.

Two other hybrids have been obtained combining, in the presence of a third species, two species which will not cross directly. One combines *G. Raimondii* with *G. hirsutum* and a wild Indian species; the other combines the genomes A_2, D_1 and D_2.

A large number of commercial varieties and strains were compared with one another and with recently developed selections and hybrids in many localities.

Resistance to bacterial blight was incorporated in a number of commercially grown varieties by crossing with Stoneville 20, which is resistant, back-crossing the hybrids to the locally adapted varieties and selecting for type and resistance.

Flax

A new winter hardy variety, Turkey Winter, has extended the flax area 200–300 miles further north. Attention is being concentrated on combining resistance to rust, wilt and pasmo with winter hardiness.

Peach

At College Station ten yellow and two white fleshed peaches adapted to mild winters have been obtained by selection. The crosses Halehaven x (Pallas x Hiley), July Gold x (Pallas x Hiley), Early Elberta x (Pallas x Hiley) and a first generation hybrid from Pallas x Hiley are promising.

Fig

A selection from the cross Green Ischia x Hamma has shown vigorous growth and winter hardiness. Its yield and quality in respect of fresh consumption and freezing are superior to many commercial varieties but as it is a purple fig its marketing value is low.

Groundnut

Breeding work at the Stephenville station is being directed towards the production of disease resistant varieties which give high yields, with pods of uniform shape and size. Strains and varieties from all over the world are used, but the small Spanish strains are generally incorporated in one of the many crosses and back crosses. Spantex is a new variety of exceptional promise, having an agreeable flavour and high oil content. Its percentage germination and yield were higher than the commercially grown Spanish variety in tests at Stephenville.

Bramble

Following the release of Earli-Ness, Big-Ness and Regal-Ness from a back cross of Nessberry to the wild dewberry (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1305), other promising progeny have been obtained from the crosses Lawton x Nessberry and Nessberry x Young Dewberry.

Strawberry

A number of promising strawberries have been developed.

Onion

Breeding work is continuing with material having resistance to thrips and pink root; the aims are to produce white onions, comparable in uniformity, yield and season, with Exel and Texas Early Grano, and to establish male sterile lines for hybrid production.

Cabbage

Two varieties, as yet unnamed, with cold resistance and high yields of dark green heads of desirable quality have been produced at College Station.

Broccoli

The aims of the present breeding programme are to produce well adapted, high quality varieties of early, uniform maturity.

Spinach
Lines with resistance to downy mildew have been obtained; further resistance to white rust, blight and cucumber mosaic virus disease is being sought.

Cantaloupe
A downy mildew resistant variety, Weslaco Strain C, has been developed at the Weslaco Station from (Smell Melon x Hales Best) x Smith Perfect. The yield and uniformity of fruit with good storing capacity are satisfactory.

Tomato
At Stephenville the variety Summer Prolific is being crossed with other lines to obtain larger fruit and resistance to *Fusarium* wilt and southern blight. Significant progress has been made in transferring the root knot resistance of a wild South American tomato to cultivated varieties; self and cross fertile hybrids have been obtained.

Cowpea
Early, high yielding strains of uniform maturity, with long peduncles and a runnerless type of growth have been obtained from crosses involving Extra Early Blackeye, Long Pod Cream and Commercial Purple Hull.

Soya bean
Varietal trials have continued for types with consistent satisfactory yields under dry land conditions.

1692.

Eighty-eighth Annual Report of the Secretary of the State Board of Agriculture, State of Michigan and Sixty-Second Annual Report of the Agricultural Experiment Station, July 1, 1948—June 30, 1949.
Bull. Mich. St. Coll. 1950 : **44** : No. 24 : Pp. 264.

Sugar beet
Cytoplasmically inherited male sterile plants have been obtained; such plants have been used as female parents to provide first generation hybrids. These promise higher yields than inbred lines.

Apple
Investigations into the reaction of established varieties to commercial freezing show that Rhode Island Greening and Jonathan retain an acceptable appearance, texture and flavour.

Tomato
Fourteen varieties were included in trials employing hormone sprays to increase fruit setting. Higher yields were obtained in several canning varieties after treatment.

Soya bean
Seven varietal trials were carried out in different localities.

1693.

Annual Report of the North Dakota Agricultural Experiment Station.
Sta. Bull. N. Dak. Agric. Exp. Sta. 1951 : No. 365 : Pp. 93.

Varietal trials are recorded for the following crops: oats, lucerne, flax, apple, onion, cabbage, broccoli, lettuce, squash and snap bean.

Wheat
It is hoped that some of the new hard red spring wheats will be sufficiently resistant to race 15 B of *Puccinia graminis* to prevent serious losses; none are immune. Many crosses are being made to obtain the highest possible degree of resistance, comparing the reaction of each new variety with standard varieties.
Leaf rust resistant forms of hard red spring wheat, obtained by crossing Mida with *Aegilops squarrosa* and *Triticum Timopheevi*, have given high yields with good milling and baking quality.

The early durum wheat variety Ld 306 has yielded well in pure stands but when planted with alternate rows of hard red spring wheats the yield has decreased. It is thought that

the hard red spring wheats have a more extensive root system, enabling them to compete favourably with durum varieties.

The results of comparative protein and sedimentation tests of varieties of hard red spring and durum wheats are reported. Protein percentages are similar; the average sedimentation value for durum wheat is 80% lower than that for hard red spring wheat, indicating differences in the configuration of the protein molecules. Dispersion tests in sodium salicylate and the low intrinsic viscosity for gluten indicate that durum protein exists as small spherical molecules.

Nugget is the name given to a new durum variety, formerly Ld 303, released by the station in cooperation with the USDA. It is an outstanding variety in respect of earliness, shortness of straw and macaroni quality.

Maize

The performance of variety Nodakhybrid 301 is surveyed in North Dakota and other states requiring early maturity.

Barley

Promising selections have been obtained from the cross Kindred x Titan; these are high yielding, resistant to *Puccinia graminis* and *Ustilago nuda*, strong strawed and of good malting quality.

The highest yield in variety tests for ten years was obtained at Williston from a new variety Vantage, which gave 102·2 bushels per acre.

Forage grasses

Wisconsin 797 is a new strain of Sudan grass with a low hydrocyanic acid content; it is to be released after naming.

Potato

A new potato variety ND 457 is being tested for yield, date of maturity and disease resistance in comparison with standard commercial varieties. Its tubers are of good shape and shallow eyed.

A promising new russet skinned potato, B515–2, resistant to scab, has been developed. Tests are being carried out to ascertain its yielding ability; cooking quality tests have been satisfactory.

Special equipment designed to test the resistance of potatoes to various forms of injury has been used with several varieties. Red Pontiac, Pontiac and Cobbler have tougher skins than Kennebec and Triumph; Essex, Canus and ND 457 are relatively tender skinned.

Tomato

In the past 25 years 15 varieties of tomato have been released by the station. Recent work includes selection of a promising early form with large fruit of good quality from the cross Bounty x Valiant. Other hybrid selections indicate that a tomato with a vitamin C content two or three times that of present commercial varieties, in combination with other desirable characters, may be developed.

A functionally sterile tomato, which is unable to shed its fertile pollen naturally, is being used in crosses to test the possibility of producing hybrid tomatoes with increased yields comparable with those of hybrid corn.

Soya bean

Consistently good yields have been obtained from the varieties Manchu, Early Mandarin and Norsoy.

1694.

Labor de la Dirección General de Fomento Agrícola en el año 1949. (**The work of the General Board for the Promotion of Agriculture in the year 1949**).
Bol. Produc. Fomento Agríc. 1950 : **2** : No. 16 : 35–68.

In addition to selection of *Carthamus*, soya bean and guayule, the following work of interest to plant breeders is mentioned:—

Castor oil plant

Selection work is reported. Argentine selections have been crossed with the Brazilian variety 38.

Sesame
Selection for resistance to *Fusarium vasinfectum* and shedding is in progress.

Groundnut
Data are provided on the fruit and forage yield and oil content of selected material, mainly of North American origin.

1695.
Informe del Departamento Nacional de Agricultura. (**Report of the National Department of Agriculture**).
Minist. Econ. Nac., Bogotá 1947 : Pp. 364.

Accounts are included of breeding projects with maize, rice, sugar cane, tomato, citrus fruits, wheat, oats, rye and potato. Details are given of inbred lines made from local Colombian maize varieties, of the flowering times of a series of rice varieties, and of the juice quality of introduced sugar cane varieties.

1696. Hagedoorn, A. L.
Genetics in Australian agriculture.
J. Aust. Inst. Agric. Sci. 1950 : **16** : 124–29.

On the basis of his recent lecture tour, the author gives his impressions of the status of animal and plant breeding and genetics in Australia, and offers suggestions on possible ways in which the science of genetics could be more effectively applied to the practical problems of breeding.

1697.
Annual Report of the Department of Agriculture and Stock, Queensland for the year 1949-50 : Pp. 99.

Wheat
Breeding work is being concentrated on grain quality. Data are presented from varietal trials on fertile alluvial soils at Hermitage in 1949, compared with those on similar soils at Biloela in 1948. Yields are inconsistent in most varieties except Gabo.
At Kairi, trials are continuing; it is hoped to obtain a rust resistant variety which could be planted in time to receive the full benefit of autumn rains.
A late maturing strain (Florence x College), with a high degree of resistance to both leaf and stem rust, was submitted by the Hermitage station for naming. It is recommended for early sowing as a dual purpose wheat.

Oats
Field tests of the varieties Klein, Victoria x Richland and Fulghum x Victoria carried out in 1949, on the eastern Darling Downs, have confirmed their resistance to *Puccinia coronata*.
Selection for rust resistance in hybrids from (Bond x Victoria) x Hajira has continued. Several progenies were highly resistant to *P. coronata*.
At the Biloela station, the rapidly growing varieties Mulga and Victoria x Richland produced more abundant grazing and hay during 1949 than others under trial. Results of periodic sampling showed differences in the protein, phosphorus and calcium contents between varieties and between plants of the same variety at different growth phases.
Queensland oat hybrids are under trial at Kairi for winter grazing qualities. Results of tests with Victoria x Richland, Fulghum x Victoria and Klein have shown that these varieties can be used for winter grazing or production of heavy hay yields.

Maize
A trial was conducted at Hermitage to compare the local variety, Star Leaming, with the New South Wales double hybrid, DS 28, and the Queensland double hybrid maize, which led in the previous trial. Results tended to be in favour of the hybrids but were inconclusive owing to incomplete maturation.

At the Ayr station a trial of three Queensland double maize hybrids and the varieties Star Leaming and Improved Yellow Dent is being continued to test the possibility of obtaining good yields to supplement grazing pastures during the normal dry spring.

Sorghum

Selection within hybrid families has continued at Kingaroy, where the promising strains are Day Milo x Dwarf Kalo, Kafir x Milo and Wheatland x (Wheatland x Betty). Progenies from Wheatland x shallu still show considerable variability.

Plainsman and Caprock, introduced from the USA, outyielded eight other promising varieties in the 1949 trial at Biloela. Weekly analyses of the percentage of prussic acid showed that although the content of Martin, an early maturing variety, remained well below 20 mg. per 100 grm. green material, several of the late maturing varieties had contents in excess of the standard level considered toxic to cattle. For some months after harvesting the grain it was found that the standing stalks of several varieties would provide forage of high protein and phosphate value. In the Burkedin district a trial of eight promising sweet varieties was made for analysis of the total nutrient content.

Several strains of the open headed variety Coastland were grown in the Burkedin district as a winter crop and showed possibilities of a heavy yield if grown in sufficient acreage to minimize bird damage.

Rice

Progress has been made with varietal tests at South Johnstone.

Leguminous forage crops

In varietal trials of *Vicia* at the Hermitage station, the woolly pod vetch Auburn appeared to be well adapted to the locality.

The lucerne varieties Hunter River, Hairy and Smooth Peruvian, Buffalo and an unnamed strain which originated in Bolivia gave satisfactory yields at Hermitage under very dry conditions.

A repeat test of CPI 9432, a strain of the pea variety Poona, showed that it provides superior autumn grazing when compared with Poona.

Potato

Yield trials of different varieties have continued. Arrangements have been made to extend the trials for resistance to purple top wilt, initiated by the Commonwealth Council for Scientific and Industrial Research.

Sweet potato

In a varietal trial at Mackay, Porto Rico, White Maltese and Abundance gave superior yields.

Cotton

Results obtained in irrigated trials of hybrid strains produced at Biloela indicate that several are superior to the commercial varieties in lint percentage and yield of both seed and lint per acre.

The efficiency of machine pickers varied with different varieties; only 78% of the bolls were harvested from leafy types.

Selection has continued within jassid resistant back cross selections, and strains of the commercial varieties Miller, New Mexico, Acala and Triumph. A high degree of resistance was obtained from Miller back crosses having an open fruit habit and suitability for mechanical harvesting.

Jute

Trials are being carried out to find varieties suited to different localities where frosts are uncommon.

Sugar cane

The results of varietal trials are reported from the sugar experiment stations. High yields were obtained from Trojan, Badila, CP 29/116, Q 28 and Q 50.

Early maturing crosses received particular attention. Entirely noble crosses were made in the Burkedin district and a further effort was made to nobilize the early maturing G 323 derived from the *S. robustum* 28 NG 251.

Early maturing F_3 seedlings with high sugar content have been obtained from a *S. robustum* cross. Retention of vigour and disease resistance is expected to be greater than in F_4 seedlings. Several varieties from the US have been incorporated in the breeding programme for early maturity and the Indian variety Co. 270 has been used for breeding progenies with high sugar content.

Tobacco
Varietal tests are being carried out at the Mareeba, Ayr and Ingham experiment stations.

Linseed
Early planting at Biloela is thought to have increased the average seed yield per acre, during the 1949 tests of seven promising varieties. Morocco gave superior yields. In a similar experiment at the Ayr station, the variety Bolley Golden outyielded Morocco by 100 lb. seed per acre but average yields were low. On more fertile soils high yields were obtained from seed multiplication plots of Punjab 47 CI 1115 and Imperial CI 1114, imported from California.

Sunflower
The results of yield tests of varieties grown at Hermitage, Ayr and Biloela are compared. Male and female parent strains of the Canadian hybrid Advance have been crossed more readily by a fertilizing technique, developed at Gratton Irrigation Research Station, which causes simultaneous flowering.

Mandarin
In an attempt to extend the harvesting period in Queensland, breeding for new and improved varieties is being carried out.

Pawpaw
Breeding for disease resistance is in progress. The varieties Bettina and Improved Peterson are being tested in all pawpaw producing areas for adaptability.

Strawberry
A uniform type of plant is being sought at Redlands by selection from strains of the variety Phenomenal; these strains differ in productivity and date of maturity.

Onion
Tests have indicated that immediate preharvest conditions control the storage capabilities of white and brown onions; the latter generally store well.
Varietal trials have begun at Rockhampton.

Leaf vegetables
Varietal trials of cabbage, cauliflower and lettuce have continued.

Bean
Varietal trials of canning beans were carried out at the Hermitage station.

Cowpea
Improvement of the cowpea variety Reeves by selection is proceeding. Six hybrid selections from (Victor x Large White) x (Skewbald x Poona) have shown promise and are being tested for wilt resistance.

1698. Engledow, F. L.
Rowland Harry Biffen 1874-1949.
Obituary Notices of Fellows of the Royal Society 1950 : **7** : 9–24.

The contribution of Sir Rowland Biffen to the foundation of modern plant breeding and his influence on the development of agricultural science in the University of Cambridge are summarized.

1699.
International fortegnelse over planteforædlere. (**International directory of plant breeders**).
Beretn. Planteavlsudv. Kbh. 1950 : p. 38.

Katalog over hvedesorter. (**Catalogue of wheat varieties**).
Ibid. 1950 : p. 38.

The Danish contribution to the above two FAO projects is briefly mentioned.

1700.

Report of the Crop Science Division Annual Meeting, A.S.A., Cincinnati, Ohio, October 31, 1950.
Agron. J. 1951 : **43** : 49–52.

The reports of the Committee on Varietal Standardization and Registration, the Turf Committee and Coordinating Committee are included. The first named has registered the following improved varieties: wheat, Cascade and Saunders; Sudan grass, Tift; Bermuda grass, Coastal; red fescue, Illahee; red clover, Kenland; cotton, Fox; and flax, Sheyenne. The Turf Committee has approved several strains for increase: bluegrass, Merion; Bermuda grass, U–3, Tifton 3 and Tifton 57; and creeping bent grass, Arlington, Cohansey, Congressional, Collins, Washington and Old Orchard.

1701. Gradov, A.
(Mičurin's teaching has become the property of millions of men).
Kolhoznoe Proizvodstvo (Collective Farming) 1950 : No. 6 : 3–4. [Russian].

The growth of Mičurinite agrobiology after Mičurin's death, and especially after the 1948 session of the Lenin Agricultural Academy, is described. Reference is made to the plant breeders Dolgušin, Lukjjanenko, Jakovlev, Kanaš, Ždanov and Ušakova who by Mičurinite methods have bred new varieties of wheat, cotton, sunflower, fruits and vegetables.

1702. Nakayama, K.
(Analysis of the dwarf habit in plants).
Bot. and Zool. 1939 : **7** : 2067–74. [Japanese].

A review is presented of the nature of the dwarf habit in plants, whether phenotypic or genotypic. The morphological nature of dwarf plants is considered first, then their comparative growth rate, mode of genetic determination, and finally their physiological and biochemical peculiarities.

1703. Rasmusson, J.
(Some selection problems in cross-fertilizing plants).
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) 2 June, 1947 Wageningen : 144–49. (Mimeographed).

Line selection is for obtaining pure lines with as many good qualities as possible. In many crops, homozygotes are less valuable than heterozygotes. The aim is then to obtain a mixture of individuals with the best possible qualities.
A possible explanation of the phenomena of inbreeding and heterosis may be found in the preponderant occurrence of dominance in conjunction with linkage of factors. In practice a start is often made with a population of different genotypes. Selection of the best parents is most important. In family selection for cross pollinators a start is made with one mother plant from which seed is collected separately. The pollinator is unknown. It is only possible to learn about the hereditary composition of a plant by studying its offspring. Undesired pollination is avoided by spatial isolation. For special experiments inflorescences are bagged. Families of the same variety can be planted closer together than others. Plants which will yield little seed are discarded before flowering. Inbred families so obtained are easily distinguishable, and, although they present a more homogeneous picture than commercial seed, are far from homozygous. Yield decreases can be stopped by crossing inbred lines. With inbreeding of cross pollinated plants seed setting decreases. By bagging only the best plants, more or less self fertile lines are obtained. For mass selection, in the spring the best plants are selected, planted out together and allowed to flower together.
By mass selection certain changes can be achieved, but hardly ever yield increases. High stability of yield potential can be noted even when other characters clearly alter. Mass selection is used to keep a variety up to standard. In many years' work on beet, the

speaker has never got a homozygote. In breeding beet, the multiplication fields are generally isolated; distances of 15, 50 or 100 m. make no difference in the percentage of crosses. In experiments with 25 and 200 plant plots of 3 varieties with different distances of isolation, the crossing is always 5%. The greatest amount of crossing occurs with the plants in the corners, less with the border plants and least in the middle, where it is 0·1 to 0·5%. Contrary to popular belief that hereditary factors only act favourably when dominant, sugar content may be increased by dominant and recessive characters. By mass selection the sugar content can be increased to a certain level but not beyond that. In the absence of selection, with cross pollinators, the proportion of the genes remains the same in subsequent generations. The deterioration that frequently occurs in practice is due to low seed production; this is particularly noticeable in crops grown for vegetative parts, e.g. beet, carrots, and cabbages. Plants with small seeds often give more seed, so that a drift in the wrong direction occurs. Examples are given of the inheritance of N content in 6 generations and the deviation in 2 generations of yield of sugar, sugar content, ash, noxious N, and bolters, between large and small beet.

1704. Guzmán, V. L.
Factores que influyen en la disminución de los rendimientos de variedades mejoradas en cultivos autógamos. (**Factors which influence the reduction in yield of improved varieties of autogamous crops**).
Agronomía, Lima 1950 : **15** : No. 62 : **33–41**.

The part played in causing decline in yield by the following factors is analysed: climatic change, differences in soil fertility, diseases, homozygotization, admixture with other varieties, and inferior competitive power.

1705. Takenaka, Y.
(**The bearing on the improvement of varieties of the relation between the genome and gigantism**).
Jap. J. Genet. 1942 : **18** : **155–56**. [Japanese].

The value of the gigas characteristics of colchicine induced autopolyploids and allopolyploids for practical plant breeding is discussed.

1706.
Methods used for field experiments in the United States.
Wkly Summ. Natural Resources Sect. Gen. Hdqrs Allied Powers, Japan 1950 : No. 270 : **9–17**. (Mimeographed).

Methods used in the United States for conducting varietal and other tests on field crops are surveyed.

1707. Špaldák, A.
Pozoruhodné ovocné dřeviny naše i cizí. (**Remarkable fruit trees and shrubs, both our own and foreign**).
Věstn. Čsl. Akad. Zeměd. 1950 : **24** : **373–80**.

The attention of the Czechoslovak Mičurinite breeders is drawn to a long list of plants, some already acclimatized to the temperate zone, found in the eastern hemisphere.
The material listed includes some Burbank varieties of fruit trees which are available from the writer.

1708. Suematsu, C.
(**Problems connected with disease resistant varieties**).
Bot. and Zool. 1940 : **8** : **234–39**. [Japanese].

A short general discussion is presented on the selection of disease resistant plants, physiological specialization, the inheritance of disease resistance and the nature of host resistance.

1709. BAUSCH, J.
Moeten de nieuwe rassen gekweekt worden voor een bepaalde grondsoort en is het dan nodig op die grondsoort een veredelingsbedrijf te stichten? (**Should new varieties be bred for a particular soil and is it then necessary to set up a breeding station on that soil**?)
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) 30 September, 1948 Wageningen : 217–26. (Mimeographed).

The speaker, who is a soils chemist, raised the questions: (1) whether varieties exist, or should be bred, that adapt themselves better than other available varieties to the conditions of a particular soil; and (2) whether it is agriculturally and economically advisable to breed varieties for particular soils. Unfortunately, in regard to many characteristics the soil may constitute a variable alterable in all respects. The condition of a soil, i.e. its fertility as regards production, is determined by its physical, chemical and biological characteristics. The physical character can be improved only with difficulty, but the chemical nature is easily altered and the biological nature less easily. The question then becomes, whether varieties should be bred for certain states of fertility or whether all varieties should be bred for those soil types which differ in practically unalterable characteristics. Good physical condition of a soil results in high productivity.

The first step in breeding should be to bring the soils to an ideally productive level. It is not possible to breed for every fertility level and in some cases it is undesirable; but this does not apply when soils show different physical conditions to which varieties react differently. The physical properties of the main soil types differ so much that the question arises whether to breed varieties for each of them, including the Dutch polder lands. It has been found that the distribution of promising varieties is limited, probably because most of the breeding stations are situated on rather heavy clay soils which are chemically fertile and in good physical condition. A few breeders are, however, working on soils not in the best biological condition, a fact which may limit their range of usefulness and result in inferior performance in trials of varieties otherwise desirable. In such cases it may therefore be preferable to select for a fertility level below the average. In general, however, it is better to adapt to optimum fertility, a procedure which necessitates research on growth physiology and the action and equilibrium of ions in the soil and plant. From a study of the relation between the desirable features of Kenia barley and the capacity of the soil to supply phosphates and nitrogen it might be possible to produce similar conditions on soils other than those at present used for malting barleys.

In breeding for drought resistance the water holding capacity of the soil must be taken into account.

Many of the variety trial fields show as much as 100% variation in productive capacity and it is suggested that variety trials of peas should be restricted to soils from which a yield of at least a ton can be obtained.

New varieties should only be bred for economically and inherently suitable soil types. This could be done for each of the main soil types and breeding stations should be established in Holland for each in an optimum fertility area.

1710. BRAUN, H.
Resistenzzüchtung und biologische Spezialisierung. (**Resistance breeding and biological specialization**).
Landw. angew. Wiss. **1949** : No. **14** : 114–23.

This lecture gives a brief historical review of early work on the breeding of disease resistant plants, examples being drawn from the successful varieties of cereals, sugar cane and potatoes, produced by American, Dutch, Swedish and German breeders. The different types of resistance and the problem of biological specialization are also discussed.

1711.
Guide to field experiments, demonstrations and farm crops.
Edinb. and E. Scot. Coll. Agric., Edinburgh **1950** : Pp. **83**.

A guide to the field experiments and demonstrations being carried out on cereals and other crops by the Edinburgh School of Agriculture is presented. An appendix provides descriptive notes on the wheat, oat and barley varieties under investigation.

1712.
Beretning om Landboforeningernes Virksomhed for Planteavlen paa Sjælland 1950. (**Report on the plant cultivation work of the agricultural associations in Sjælland 1950**).
København 1951 : Pp. 386.

As in previous years (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2150) this report, compiled by the Plant Cultivation Committee of the Joint Sjælland Agricultural Associations, contains, in addition to other information, reports on the local field experiments carried out in various localities in Sjælland. The crops in these trials included varieties and strains of wheat, rye and barley, potatoes, clover, lucerne, vetch, root crops, flax, forage peas and peas for processing.

1713. Kofoed, A. Dam.
50. Beretning om Planteavlsarbejdet i Landboforeningerne i Jylland. (**Fiftieth report on plant production work in the agricultural societies in Jutland**).
Skanderborg 1950 (1951) : Pp. 524.

The work done by the Jutland agricultural societies in connexion with crop production during 1950 is reviewed. The report records in detail the performance of many varieties and strains of wheat, barley, rye, oats, maize, peas, potatoes, root crops, lucerne and clovers in numerous local field trials in Jutland.

1714.
Overseas Food Corporation. Scientific Department East Africa. Annual Report for the Crop Year 1948–49 : Pp. 132. (Mimeographed).

Detailed reports of varietal trials of maize, sorghum, sunflower, safflower, groundnut and soya bean carried out during the season 1948–49 in Tanganyika are included (cf. Abst. 914).

1715. Agro.
Svalöfsbolaget fyller 60 år. (**The Svalöf Company completes 60 years of existence**).
Lantmannen 1951 : **35** : 127–28.

The foundation, achievements, development and present functions and work of the General Swedish Seed Co. Ltd., founded in 1891 in Svalöf, are recorded with due recognition of the important place it holds to-day in Swedish agriculture and plant breeding.

CEREALS

1716. Fiedler, J.
Anatomická variabilita a její využití pro šlechtění plodin. (**Anatomical variability and its utilization in plant breeding**).
Věstn. Čsl. Akad. Zeměd. 1950 : **23** : 181–85.

Czechoslovakian experiments aimed at establishing a correlation between nervation of the first leaves in cereals and their grain yields are reported. Preliminary results suggest that some direct correlation exists between variability in leaf nervation and yielding capacity. The material included 13 spring wheats, 15 lines of the winter wheat variety Bastard, 16 lines of the winter wheat Pyšelka, and 11 spring barley varieties.

1717. Wagner, S.
Pflanzenbauliche und züchterische Fragen beim Brotgetreide. (**Problems of cultivation and breeding in cereals**).
Schweiz. landw. Mh. 1950 : **29** : 4–23.
Keller, E. R.
Pflanzenbauliche und züchterische Fragen beim Brotgetreidebau. (**Problems of cultivation and breeding in cereal growing**).
Schweiz. landw. Z. 1950 : **78** : 1434–40.

In the first paper the author points out that despite improvements, tetraploid rye shows an incidence of gapping 12–15% higher than that of normal rye, but the 50% higher 1000 corn

weight of the tetraploid results in a 15% increase in yield; the resistance to lodging too is higher, but later ripening and susceptibility to rust are disadvantages.
The possibilities of the wheat-rye hybrid for cultivation are discussed. It is winter hardy and disease resistant, can thrive in poor conditions and resembles wheat in quality; yields are, however, unsatisfactory, but it is hoped to improve them by doubling the chromosome number.
The progress made in producing wheats resistant to lodging is seen on comparing the original land varieties with Plantahof, Probus and Mont Calme 22 and 245, but varieties still more resistant are needed. The wheat varieties from Western Europe have stiff straw, whereas the stem of Probus is elastic, so it can better rise again. If, therefore, by breeding, the stem of Probus were to be shortened, whilst retaining the elasticity, the resistance to lodging would be increased. For this problem the method of continuous back-crossing is best and has the advantage that only 8–9 years instead of 15 years are required in breeding a variety. It is a method specially suited to highly bred varieties.
The second paper is a popular account of S. Wagner's paper summarized above.

1718. Doxey, D. and
Rhodes, A.
The effects of the gamma isomer of benzene hexachloride (hexachlorocyclohexane) on plant growth and on mitosis.
Ann. Bot., Lond. **1951 : 15** : 47–52.

Treatment of rye and wheat seeds with China clay dust containing 10% and 20% pure γ-benzene hexachloride resulted in c-mitotic effects. The threshold concentrations of γ-benzene hexachloride for inhibition of root growth and for the production of abnormal cytological effects appeared to be the same; it is concluded that the growth inhibiting and mitotic actions of the substance are causally related.

1719. Kondo, N.
(Colchicine treatment of *Secale*, *Haynaldia* and *Aegilops*).
Bot. and Zool. **1940 : 8** : 1915–16. [Japanese].

An extended version of this paper has already been summarized in *Plant Breeding Abstracts*, Vol. XII, Abst. 477.

1720. Carroll, J. C. and
Chung-hua Lee Peng.
A comparison of the niacin and pantothenic acid content of certain cereal grains grown under the same environmental conditions.
Science 1951 : **113** : 211–12.

The following were grown under the same environmental conditions in Ohio and analysed for niacin and pantothenic acid content: the common wheat varieties Seneca, Trumbull, Butler and Thorne; the oat varieties Clinton and Wayne; two double cross hybrids of maize; and the soya beans Hawkeye and Lincoln. The four kinds of crops showed marked differences in content of both niacin and pantothenic acid, the differences being greater in the case of niacin. The niacin content exhibited wide intervarietal differences in oats, maize and soya bean. Marked intervarietal difference in content of pantothenic acid was noted only in soya bean.

1721. Skaare, S.
Sortsegenskaper og skurtresking. **(Varietal characters and combine harvesting).**
Norsk. Landbr. **1951 : 17** : 106–07.

The qualities that render a cereal variety suitable for combine harvesting are discussed, special reference being made to Swedish varieties and research on the subject, including

E. Åberg's investigations in progress on wheat, barley and oats. Strength of straw and the tendency to shedding are among the special features under investigation and, as regards the first named characteristics, the 2-rowed barley Herta is mentioned as outstanding; even at the end of September the stand was still erect and fit for combine harvesting, though on 22 August it had already been judged ready for cutting.

1722. COURTOIS, J. and
PEREZ, C.
Teneur en inositophosphates, et activité phytasique de diverses graines. **(The content of inositophosphates and the phytase activity of various seeds).**
Ann. Nutrit. Aliment., Paris 1948 : **2** : 143–52.

The 20 kinds of seeds tested included wheat and other cereals. The wheats had the highest phytase content and the hard wheats were more active than the soft wheats.

1723. ÅBERG, E.
Sortegenskaper och skördetröskning. **(Varietal characteristics and combine harvesting).**
Weibulls Ill. Årsb. 1950 : **45** : 21–25.

The characteristics required in cereal varieties intended for combine harvesting are considered with comments on the suitability of particular varieties of wheat, barley and oats for that purpose. The barley Herta receives special mention for its excellent stand at Ultuna, late in September, while other barleys had passed the stage when combine harvesting was possible (cf. Absts. 1721 and 1847).

1724. EKSTRAND, H.
Skador på de övervintrande grödorna vintern 1949–50. **(Damage to the overwintering crops in the winter of 1945-50).**
Växtskyddsnotiser 1950 : No. 4 : 57–62.

In this detailed account of the damage suffered by different crops and even different varieties and strains as a result of attack by various fungous diseases in Sweden in 1945–50, the author records several instances of disease resistance of polyploid forms, e.g. the Finnish rye Toivo, and tetraploid clover strains. Among the wheats, Virtus, the Finnish variety Olympia and the Swedish land wheat Sammet [Velvet], though not obtained by polyploidization, are also mentioned as resistant.

1725. URRIES, M. J. DE.
Las royas de los cereales. **(Cereal rusts).**
Bol. Inst. Nac. Invest. Agron., Madr. 1950 : **10** : 397–475.

This general review on cereal rusts includes sections on physiological races, on the genetics of resistance, and on the breeding of resistant varieties.

1726. HORBER, E.
Untersuchungen über die gelbe Getreidehalmfliege *Chlorops* (*Oscinis*) *pumilionis* Bjerkander 1778 und ihr Auftreten in verschiedenen Höhenlagen der Schweiz. [**Investigations concerning the goutfly *Chlorops* (*Oscinis*) *pumilionis* Bjerkander 1778 and its occurrence in various high-lying districts of Switzerland).**
Landw. Jb. Schweiz. 1950 : **64** : 887–1001.

On the basis of his investigations, which are described, the author doubts the existence of biological races of the goutfly which prefer certain species of cereals.
Damage to a cereal by the fly is mainly caused by the summer generation. Counts, however, on the winter ryes Petkus, the Swedish Königsroggen [King's rye] and a hybrid

of Rothenbrunner and Petkus, which were most severely attacked, showed marked varietal differences; the incidence of attack was much lower in winter barleys which had been sown in the same field. Studies by various authors of the susceptibility of winter and spring wheats are surveyed historically; the varietal differences in susceptibility and the relation between developmental rhythm and susceptibility are discussed; the special susceptibility of English club wheat and its hybrids is also mentioned.
Arguments are advanced to show that the degree of attack by the goutfly in wheats is a criterion for the suitability of a variety for a certain locality.
Varietal differences in susceptibility which have been noted in barleys are also mentioned.

WHEAT

1727.
Varieties of wheat recommended for 1951 sowing.
Agric. Gaz. N.S.W. 1951 : **62** : 17–22, 40, 52.

The recent performance of wheat varieties in New South Wales with regard to resistance to rust, blights and frost is discussed. Varieties now recommended for grain or hay production in the different regions of New South Wales are listed. Detailed descriptions of recommended wheats and of those likely to be grown are provided.

1728. Pini, P. L.
La granicoltura nella collina. (**Wheat cultivation in hilly districts**).
Humus, Milan 1950 : **6** : No. 9 : 16–18.

In a general discussion of the problems of wheat growing on high ground in Italy it is pointed out that very few varieties have been bred specially for this purpose; in the higher zones certain old mountain races such as Virgilio and Frassineto are found. Great improvements are foreseen if geneticists turn their attention to producing new wheats for the highland zones of intensive wheat cultivation.

1729. Forlani, R.
Le più recenti razze di frumento. (**The most recent varieties of wheat**).
Humus, Milan 1950 : **6** : No. 9 : 6–8.

The wheat varieties released in Italy since the war contain few if any new wheats suitable for high or even moderate altitudes. In the Lombardy plains the highest yields have been given by the variety O.10 produced by the Bologna Seed Producers, though it does well only under specially favourable conditions. In slightly less favourable circumstances Mara, produced by Michahelles, has proved the best. Bonvicini's Funo and Fortunato are named as promising wheats; also Grifo [Griffin] and Freccia [Arrow] of Michahelles; for higher ground Tevere [Tiber] and Fiorello [Floret] are recommended, the latter particularly for its standing capacity. The variety considered adaptable to the widest range of growing conditions is S. Pastore, a Strampelli wheat further selected by Maliani; it is the best winter wheat to use when sowing is delayed.
The author has produced some perennial *Triticum-Agropyron* hybrids but so far they are of no practical interest.

1730. Fajersson, F.
Weibulls original Eroicavete II. Ny sort, härdigare än det gamla Eroicavetet. (**Weibull's Eroica II wheat. A new variety, hardier than the old Eroica wheat**).
Weibulls Årsb. 1950 : **1–4**.

Eroica II, a selection from Eroica (cf. *Plant Breeding Abstracts*, Vol. XIII, Absts. 476 and 478 and Vol. XVI, Abst. 1204), equals its parent variety in strength of straw and quality of grain, while giving approximately the same yield of grain and showing marked superiority in hardiness (cf. Abst. 872).

1731. Fajersson, F.
Pondusvårvetet alltjämt främst i de officiella försöken. (**The spring wheat Pondus always foremost in the official trials**).
Weibulls Årsb. 1950 : 9–12.

Details are given of the performance of this wheat already referred to in *Plant Breeding Abstracts*, Vol. XX, Abst. 197 and Vol. XXI, Absts. 872 and 1737.

1732. Wagner, S. and
Zweifel, J.
La nouvelle variété suisse de froment d'automne Probus. (**The new Swiss variety of autumn wheat Probus**).
Rev. Romande Agric. Viticult. Arboricult. 1951 : **7** : 17–19.

The performance and qualities of this new wheat, derived from the cross Trubilo x Plantahof, made in 1935 by Buchli of the Federal Experimental Station, Oerlikon, Switzerland, are described under the following heads: (1) yield; (2) cultivation value, i.e. overwintering capacity, earliness and resistance to rust and lodging; and (3) milling and baking values. As regards (1) and (2) the new wheat can be compared with Mont-Calme 245, and as regards (3) with Plantahof.

1733. Valdeyron, G. and
Séguala, J.
État actuel de l'amélioration des blés en Tunisie. (**The present state of the improvement of wheats in Tunis**).
Ann. Nutrit. Aliment., Paris 1948 : **2** : 65–68.

The development and scope of wheat breeding in Tunis are outlined, special mention being made of the soft wheat Florence x Aurore and the semolina wheats Mahmoudi 552 and Sindyouk x Mahmoudi 870 (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 144).

1734. Stoa, T. E.
New varieties of wheat. Their advantages and limitations.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1951 : **13** : 95–100.

The new hard red spring wheats Lee (cf. Abst. 979) and Rushmore (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 193) and durum wheats Vernum and Nugget are discussed. Vernum is a relatively early amber variety, developed cooperatively by the US Department of Agriculture and the North Dakota Agricultural Experimental Station, from the hybrid Mindum x Vernal back-crossed four times to Mindum. Released in 1947, Vernum has a fair but not high yielding capacity; it is recommended for the more southern parts of the durum growing region and elsewhere if only more earliness is desired. Nugget, also developed cooperatively by the North Dakota Station and USDA, was selected from the cross (Mindum x Carleton) x (Heiti x Stewart). It equals Stewart in resistance to leaf and stem rust, is superior in macaroni quality and ripens earlier; it is recommended for the same areas of North Dakota as Vernum. No large changes in varietal recommendations are advocated. It is also pointed out that no variety at present available possesses satisfactory resistance to race 15B of stem rust, prevalent for the first time in 1950.

1735. Schad, C.
Recherche et expérimentation sur la qualité des variétés de blé dans la région du Massif Central. (**Research and experiments on the quality of wheat varieties in the Massif Central region**).
Ann. Nutrit. Aliment., Paris 1948 : **2** : 69–85.

A more elaborate discussion of the subject here treated is contained in the article reviewed in *Plant Breeding Abstracts*, Vol. XX, Abst. 1258.

1736. Bustarret, J.
État actuel de l'amélioration du blé en France. **(The present state of wheat improvement in France).**
Ann. Nutrit. Aliment., Paris 1948 : **2** : 25–35.

This lecture outlines, from the standpoint of the breeder, the evolution of the wheats grown in France and reviews the characteristics of the present day wheats and their effect in increasing production. The resistance of French wheats to cold, drought and parasitic diseases, their adaptation to environmental conditions, and their baking quality and its determination are also considered.

1737. Fajersson, F.
Weibulls original Pondusvårvete. **(Weibull's Pondus spring wheat).**
Weibulls Ill. Årsb. 1950 : **45** : 3–7.

A detailed account is given of the ancestry of the new wheat Pondus and its performance in official Swedish trials with Progress and Kärn II (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 1503, Vol. XX, Abst. 197 and Vol. XXI, Abst. 872 and Abst. 1731).

1738. Karapetjan, V. K.
(Changing hard wheats into soft wheats).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 6 : 8–13. [Russian].

Experiments on directing changes in wheat at the Institute of Genetics of the USSR Academy of Sciences are described. The material comprised pure lines of the hard wheats Hordeiforme 10 and Melanopus 69. These wheats were changed from hard spring wheats into soft winter wheats by sowing for more than one generation in late autumn. The changes were observed in the second, third and fourth generations, when *Triticum durum* wheats segregated forms of the *ferrugineum*, *erythrospermum*, *caesium*, *milturum*, *cinereum*, *lutescens*, *pseudo-lutescens* and *compactum* types of soft wheat. Some individual forms were of intermediate types which could not be identified. A reference is made to similar experiments with Hordeiforme 10 conducted in 1946–1948 at Omsk, when the same botanical varieties segregated.
The forms of the apparently unchanged female parent type in the fourth generation were analysed by M. M. Jakubciner. He found that these forms also underwent changes and segregated forms of other botanical varieties of hard wheats. In Hordeiforme 10 for instance individuals of the *erythromelane* and *italicum* types were observed. The vast material obtained in the experiments included one plant with one ear of the soft wheat type and the other of the hard wheat type. A theory is advanced that a wheat cannot combine winter habit with hard wheat characters and that upon acquiring the winter habit hard wheat becomes a wheat of the soft type. Evidence obtained in experiments at the USSR Institute of Breeding and Genetics in support of the thesis is discussed. It includes data on segregations in respect of spring or winter habit.
The soft wheats obtained from Hordeiforme 10 and Melanopus 69 planted in autumn or spring had progenies showing morphological variations. Plants with awned ears frequently segregated plants with awnless ears. Curiously, most of the segregates, e.g. red ear, awnless ear and red grain, were dominant. No white grained individuals, or awned individuals in the progeny of the awnless forms, segregated.
Cytological analyses of the various botanical varieties of soft wheats obtained from the hard wheats showed that they had 42 chromosomes, while the rootlets of the Hordeiforme 10 and Melanopus 69 controls had 28 chromosomes.
Ear analyses of the hard wheats which remained apparently unchanged after repeated sowing in late autumn showed that the ears of some individuals produced, besides the normal hard wheat grains, occasional grains of modified shape and colour. The progenies grown from separate ears showed variation regarding pubescence and pigmentation at the base of the culm. Cytological analyses of these wheat plants showed that some of them

had the 28 somatic chromosomes of hard wheats and others the 42 chromosomes of soft wheats. One individual combined the soft wheat character of pubescence with the chromosome number of hard wheat.
Plants grown from the modified seed of hard wheats frequently produced pubescent plants, pubescence being a character normally associated with soft wheats.
Biochemical analyses of the changed wheats made at the Institute of Biochemistry of the USSR Academy of Sciences by N. I. Sisakjan established that changes in the enzymatic system occurred in the hard wheats changed into soft wheats, their new system becoming more like that of the soft wheats.
It is concluded that changes of *durum* wheats into *vulgare* wheats are the result of the cumulative effect of external conditions upon plants subjected to their action for several generations.

1739. Jonard, J.
La notion de précocité chez le blé. (**The idea of earliness in wheat**).
Ann. Nutrit. Aliment., Paris 1948 : **2** : 105–10.

The meaning and causes of earliness are analysed and discussed with reference to the various physiological phases through which the growing wheat plant passes and their interrelations. Effects of soil and climate are also considered (cf. Absts. 981 and 1735).

1740. Vilmorin, M. de.
La création des blés d'automne de bonne qualité boulangère. (**The creation of autumn wheats of good baking quality**).
Ann. Nutrit. Aliment., Paris 1948 : **2** : 45–48.

A brief outline is given of the lines followed and the difficulties encountered by French breeders in their attempt to produce a good French wheat with high baking quality. Back-crossing is being used even before the breeding lines are fixed.

1741. Matsumoto, K. and
Kondo, N.
(**Two new amphidiploids in *Aegilops***).
Jap. J. Genet. 1942 : **18** : 130–33. [Japanese].

The amphidiploid hybrids *Ae.bicornis* x *Ae.uniaristata* and *Ae. squarrosa* x *Ae. uniaristata* were produced by colchicine treatment. Fertile amphidiploid spikes were larger than the sterile ones and showed perfect dehiscence of the anthers and 75% good pollen.

1742. *Ferwerda, F. P.
Tarwe-rogge bastaarden. (**Wheat-rye hybrids**).
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) 4 March, 1948 Wageningen : 206–16. (Mimeographed).

The little seed obtainable by crossing wheat and rye has a low germination capacity. The rye x wheat cross is even less successful than the reciprocal. Some central and east Asiatic spring wheats, however, comprise types which cross readily with rye; this characteristic depends on one or possibly two recessive factors. The F_1 plants resemble each parent in some respects. Their glumes remain open until the ear is ripe and their anthers, which look more or less empty and usually dry up without dehiscing, generally contain imperfect pollen. The stigmas seem normal, but no seed is set unless artificial pollination is carried out; and the F_2 plants are as sterile as the F_1, except in rare cases where moderate fertility was noted. Only about 10 such plants have been recorded. The F_1 hybrids have 21 wheat + 7 rye chromosomes and at meiosis 11 may pass to one pole and 17 to the other; all 28 chromosomes have sometimes passed to one pole, and a pollen

* An extended summary of this paper is on file at the Bureau.

"tetrad" may consist of 8 pollen grains. The few fertile offspring known from such hybrids were amphidiploids, termed *Triticale.*
Wellensiek's *Triticale* material, mostly hybrids of Juliana, Carsten V and Lovink with Petkus obtained in 1942, was first multiplied vegetatively, then treated with colchicine, and flowered in 1944. The F_3 and F_4 plants are very attractive before flowering; they show strong compact growth and healthy dark green leaves. Flowering is prolonged practically until the plant dies. Seed is scanty. Lovink x Petkus showed the best set. The plants are not as hardy as their parents; Carsten V x Petkus plants were hardiest.
Chromosome doubling does not always occur in all organs and a method is suggested whereby plant chimeras may be avoided by colchicine treatment of the F_1 plants which can then be used to pollinate themselves or be pollinated by stable amphidiploids. The ears formed will contain some 56-chromosome grains, distinguishable by their plumper appearance. From them plants can be raised and any with dehiscent anthers and good pollen can be selfed or intercrossed after cytological checking.

1743. O'Mara, J. G.
The effects of chromosome substitution on competition between gametes.
Genetics **1950 : 35 :** p. 682. (Abst.).

Plants of *Triticum vulgare* ($n = 21$) deficient for the pair of chromosomes IX and which had, in place of the missing pair, a pair of chromosomes from *Secale cereale* ($n = 7$) were crossed with *T. vulgare.* The resultant plants had 20 pairs of chromosomes and two univalent chromosomes, one univalent being the chromosome of *T. vulgare* not represented in the original plant, and the other the chromosome of *S. cereale* which had been substituted in the original plant. The male gametes produced by these plants may be expected to consist of four types, excluding the products of misdivision: nullisomic gametes, gametes with chromosome IX of *Triticum,* gametes with the *Secale* chromosome, and those in which both these chromosomes are present. If pollen containing these gametes is applied to stigmas of normal *T. vulgare* plants, data from the resultant progeny should indicate the relative success of the different classes of gametes in competition. It was found that the normal gametes did not have an extreme advantage. From 74 mixed pollinations the following percentages of gametic success were obtained: normal gametes, 60%; gametes with either the *Triticum* or *Secale* chromosome, 26%; gametes with both the *Triticum* and *Secale* chromosomes, 8%; and nullisomic gametes, 6%. The data suggest that the substitution of a chromosome from a different genus may to a significant degree compensate for the loss of the normal chromosome in species with a high level of polyploidy such as *T. vulgare.*

1744. Uchikawa, I.
(The determination of the chromosomes carrying the compactoid and speltoid genes in wheat).
Jap. J. Genet. **1942 : 18 :** 123–25. [Japanese].

On crossing type I heterozygous compactoid wheat ($2n = 43$, ABCC/ABC) with a C homozygous speltoid ($2n = 42$, ABS_1/ABS_1), the F_1 consisted of a mixture of heterozygous speltoids ($2n = 42$, ABS_1/ABC) and plants of normal appearance ($2n = 43$, $ABS_1/ABCC$). During meiosis, the heterozygous speltoids formed 21 bivalents, though occasionally a pair of univalents was observed. The meiotic configuration of the normal type plants was $21_{II} + 1_I$.
Next, the type I heterozygous compactoid was crossed with a wheat of normal appearance carrying a pair of S_2 fragment chromosomes ($2n = 42$, ABS_2/ABS_2). In the F_1, plants of normal appearance ($2n = 42$, ABS_2/ABC) and semicompactum types ($2n = 43$, $ABS_2/ABCC$) were obtained. Meiosis was generally regular in the normal type plants; in the semicompactum type, the meiotic configuration was $21_{II} + 1_I$.
It is concluded from these results that the compactoid gene is located on the S_2 fragment, believed to be derived from the C chromosome.

It has already been shown (cf. Abst. 222) that the F_1 of the cross C homozygous speltoid wheat ($2n = 42$, ABS_1/ABS_1) x B homozygous speltoid wheat ($2n = 40$, AB/AB) is a homozygous speltoid ($2n = 40 + 1$ fragment, AB/ABS_1). In the F_2, three types segregated, of constitution $2n = 40$, AB/AB, $2n = 41$, AB/ABS_1, and $2n = 42$, ABS_1/ABS_1, respectively.
In addition, a wheat of normal type carrying S_2 fragments ($2n = 42$, ABS_2/ABS_2) was crossed with a B homozygous speltoid. The F_1, a heterozygous speltoid, had $2n = 41$ chromosomes, the meiotic configuration being $20_{II} + 1_I$; the chromosome constitution of this type is inferred to be AB/ABS_2. On selfing, three types segregated, namely, wheats of normal appearance ($2n = 42$, ABS_2/ABS_2), heterozygous speltoids ($2n = 41$, AB/ABS_2) and homozygous speltoids ($2n = 40$, AB/AB). It is clear therefore that the S_2 fragment does not carry the speltoid gene.
On crossing a short normal wheat ($2n = 40$) with the B homozygous speltoid, an F_1 was obtained with $2n = 40$ chromosomes, the usual meiotic configuration being $19_{II} + 2_I$. These plants were heterozygous speltoids. Since the B homozygous speltoids do not carry the C chromosome, the latter cannot be responsible for the speltoid character. The short normal parent is believed to be of chromosome constitution BC/BC since the alternative AC/AC would be expected to produce homozygous speltoids in the above cross. The chromosome carrying the speltoid gene must therefore be the B chromosome.

1745. MATSUMURA, S.,
MATSUMOTO, K.,
YAMASHITA, K. and
NAKAMURA, Y.
(The differences in chromosome number in the F_2 of pentaploid wheat hybrids and the various causes contributing thereto).
Bot. and Zool. 1939 : **7** : 1719–25. [Japanese].

Investigations are reported on the range in chromosome number of F_2 plants of the crosses *Triticum durum* var. *Reichenbachii* x *T. vulgare* var. *eryothrospermum* and *T. persicum* var. *stramineum* x *T. compactum* var. *creticum*. Differences in the frequency distribution from the theoretical expectation are attributed to greater activity of the pollen grains with the higher chromosome numbers, and differential univalent and zygote elimination.

1746. LOVE, R. M.
Varietal differences in meiotic chromosome behavior of Brazilian wheats.
Agron. J. 1951 : **43** : 72–76.

Using the term "meiotic index" for the percentage of normal quartets, micronuclear counts of *Triticum vulgare* pollen at the California Agricultural Experiment Station revealed distinct differences in the meiotic indices of 19 Brazilian varieties; of these, 12 had high indices and are considered cytologically stable. The remaining 7 contained some plants with low meiotic indices; a few with higher indices indicate that stable lines might be obtained by selection. A low meiotic index was generally caused by failure of pairing between one or two bivalents or by lagging.

1747. BELL, G. D. H.
Investigations in the Triticinae. I. Colchicine techniques for chromosome doubling in interspecific and intergeneric hybridization.
J. Agric. Sci. 1950 : **40** : 9–18.

Chromosome doubling by colchicine has been obtained in fifteen crosses in the genus *Triticum*, in thirty-four *Triticum-Aegilops* crosses and in one *Agropyron-Triticum* cross. Five main treatments were used: (1) capping cut-back tillers with a small glass phial

containing colchicine; (2) injecting the main axis and one or more tillers with a hypodermic needle; (3) capping the tillers and injecting the main axis; (4) wrapping the bases of young plants in colchicine-soaked cotton wool in inverted glass jars; and (5) root absorption by suspending the plants over a solution in which the roots were immersed. Efforts were made to treat all plants at the same stage of growth. Each cross was given five main treatments and more than one plant subjected to each treatment. Different colchicine concentrations were superimposed on treatments (1), (2) and (3), ranging from 0·05 to 0·5%, so that, in all, sixteen separate treatments were used.

Interspecific crosses in the genus *Triticum* in which chromosome doubling had not been previously recorded included *T. dicoccoides* x *T. monococcum*, *T. dicoccoides* x *T. aegilopoides*, *T. durum* x *T. aegilopoides*, *T. pyramidale* x *T. aegilopoides*, *T. georgicum* x *T. monococcum*, *T. dicoccoides* x *T. Timopheevi*, *T. dicoccum* x *T. Timopheevi*, *T. Timopheevi* x *T. pyramidale* and *T. Timopheevi* x *T. orientale*. The twenty-two previously unrecorded instances of chromosome doubling in the *Triticum-Aegilops* intergeneric crosses included *Ae. speltoides* x *T. dicoccum*, *Ae. speltoides* x *T. durum*, *Ae. caudata* x *T. turgidum*, *Ae. caudata* x *T. durum*, *T. aegilopoides* x *Ae. bicornis*, *T. dicoccoides* x *Ae. bicornis*, *T. turgidum* x *Ae. bicornis*, *Ae. triuncialis* x *T. dicoccoides*, *Ae. triuncialis* x *T. turgidum*, *Ae. triuncialis* x *T. persicum*, *T. Timopheevi* x *Ae. ovata*, *Ae. ovata* x *T. aegilopoides*, *Ae. ovata* x *T. Timopheevi*, *Ae. cylindrica* x *T. aegilopoides*, *Ae. cylindrica* x *T. dicoccum*, *Ae. cylindrica* x *T. persicum*, *T. dicoccoides* x *Ae. ventricosa*, *T. dicoccoides* x *Ae. turcomanica*, *Ae. longissima* x *T. dicoccum*, *Ae. biuncialis* x *T. dicoccoides* and *Ae. biuncialis* x *T. dicoccum*. The single intergeneric *Agropyron-Triticum* cross in which chromosome doubling had not previously been recorded was *T. durum* x *A. obtusiusculum*.

A comparison of the efficiency of each of the five methods of treatment was made in terms of plant survival, plant fertility and ear fertility. Chromosome doubling and consequent fertility was not complete in a plant or even in an ear, although individual ears of high fertility have been obtained; differential cross response to colchicine action and cross-group response to particular treatments were also observed.

1748. Yamazaki, Y. and
Ishihara, M.
[Studies on regional differences in the occurrence of polyploid plants from twin seedlings of common wheat (preliminary report)].
Jap. J. Genet. 1942 : **18** : 121–22. [Japanese].

Notes are presented on the frequency of twin seedlings in wheat samples drawn from different parts of Japan.

1749. Abhazava, A. A.
(Grading the seed improves its productiveness).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 6 : 56–59. [Russian].

In experiments conducted in Georgia, USSR, the seed of the winter wheats Dolis-Puri and Kahetinskaja Vetvistaja [Branching Kahetian] had better heritable properties when it was taken from the centre of the ear, where it is largest and heaviest, than when it was gathered from the apical or basal ends of the ear.

1750. Zaharževskiĭ, A. A.
(The hybrids of *Triticum Timopheevi*).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 7 : 19–25. [Russian].

Promising fertile hybrids between variety Hordeiforme 27 of *T. durum*, and *T. Timopheevi* were obtained at the Krasnodar State Breeding Station, without the use of colchicine, by applying indoor nursery training of the F_1 and F_2 upon good soils before transplanting the

plants to the field in the spring. Several lines in the F_4 and earlier generations were more productive than the control Hordeiforme 27.
Unfortunately, all but some F_1 and F_2 seed was lost during the war. This F_1 and F_2 material was multiplied up and selected for productiveness. As a result several advanced generation hybrids yielding 4·2% to 29% more grain than Hordeiforme 27 were obtained. The hybrids have a healthy appearance and show resistance to drought and sand storms. Their field viability is higher than that of the control plants. Mention is made of amphidiploids of *T. durum* x *T. Timopheevi* obtained in Russia by A. P. Žebrak by the colchicine method. These are described as of little value because they were less fertile than hard wheat and had brittle ears and grains too firmly attached to the rachis.

1751. Peive, J. V.
(The main results of the scientific research work of the Academy of Sciences of the Latvian SSR for 1949).
Latv. PSR Zinātņu Akad. Vēstis 1950 : **2**(31) : 13–44. [Russian].

Mičurinite plant breeding in Latvia includes large scale trials of Lysenko's branching wheat and the study of phasic development in the standard varieties of cereals.
Collections were made of the apples and pears cultivated in the Liepaĭskiĭ, Aĭzputskiĭ and Tukumskiĭ districts. Some of these are being multiplied up for release to horticulturists. Hybridization between local and Mičurin apple varieties at the Pure Research Station is reported.
Breeding work with vines at this institute involved crosses between local and central Asiatic varieties and between Mičurin and the hardier early west European vines. Large numbers of hybrids of vines were obtained and 86 new varieties developed.
Interspecific hybridization of potatoes is in progress, the aims being productive varieties showing resistance to cold and diseases. Reference is made to promising material contained in a Mičurin collection of 200 different potatoes.

1752. Vasiljčenko, L.
(High yielding awnless varieties of winter wheat).
Kolhoznoe Proizvodstvo (Collective Farming) 1950 : No. 12 : p. 45. [Russian].

The following new productive awnless winter wheats have been developed in the USSR, the yields being those recorded in 1950 trials at Mirgorod. Stepnaja 135 [Steppe 135], bred at the Dokučaev Scientific Research Institute for the central black-earth belt, yielded 32·3 c. per ha. Lutescens 59, developed at the Belaja Cerkovj Breeding Station, gave 40·2 c. per ha.; Velutinum 37, also originating from the Belaja Cerkovj Breeding Station, yielded 38·4 c. per ha.; and Pimenka [Pimen], bred at the Scientific Research Institute of Beet Growing, yielded 37·8 c. per ha. It is suggested that these new varieties should supersede the bearded varieties Ukrainka [Ukrainian] and Lesostepka 75 [Woody Steppe 75], cultivated extensively in the Poltava province. The former awnless varieties grown in the province, Milturum 120 and Albidum 676, yield less than the bearded standard varieties.

1753. Grimaldi, A.
Sulla presenza di spighette soprannumerarie nel frumento, **(On the presence of supernumerary spikelets in wheat).**
Ann. Fac. Agra., Perugia 1942 : **1** : 101–10.

The occurrence of supernumerary spikelets in a large number of early and late varieties of wheat in Perugia and other districts in Italy led to an investigation of the causes of the phenomenon by pot experiments under different conditions of temperature and humidity. Though the results suggest that the anomaly may be due to climatic factors, and temperature and humidity in particular, the possibility of hereditary influence cannot be excluded.

1754. SVENSON, J.
Untersuchungen über die Kleberqualität von Winter- und Sommerweizenstämmen der Erntejahre 1947–1949. (**Investigations on the quality of the gluten of winter and spring wheat strains of the harvest years 1947-1949**).
Züchter 1950 : **20** : 356–57.

The proportion of good samples of winter and spring wheats in 3089 wheat strains tested in the last three years is shown in a table. In Germany breeding for quality is more important for winter than for spring wheats. The present breeding aim is the production of new wheat varieties having strong gluten, so that ultimately the German wheats in which the gluten is weak may be replaced by wheats of good baking properties. The difficulty of producing winter wheats with strong gluten is that in breeding operations the following factors must also be taken into account: winter hardiness, yield, size of kernel and resistance to lodging, disease and germination in the ear. Some breeders are trying to obtain wheat with grain of as light a colour as possible.

1755. VITRAC, E.
La force boulangère des blés dans la sélection. (**The baking strength of wheats in selection**).
Ann. Nutrit. Aliment., Paris 1948 : **2** : 49–57.

In this brief account of the progress made in France by the author in improving the baking quality of wheats undergoing selection, details are given of the agreement obtained by the Brabender and the Chopin methods of estimating quality. To estimate gluten quality Brabender's glutograph was used with encouraging results.
For breeders wishing to increase baking strength a simple programme is outlined.

1756. FAJERSSON, F.
Det gäller inte blott kvantitet utan också kvalitet. (**It is a question not only of quantity but also quality**).
Weibulls Ill. Årsb. 1950 : **45** : 27–32.

The work that occupies plant breeders during the winter is exemplified by an illustrated account of the routine investigations that are carried out at Weibullsholm, Sweden, on the baking and flour quality of varieties of wheat.

1757. FAJERSSON, F.
The micro-method of Berg for determining the degree of grittiness of flour from different varieties of wheat.
Agri. Hortique Genetica, Landskrona 1950 : **8** : 109–17.

Grittiness of wheat flour has already been found by S. O. Berg to be a heritable character, without correlation with protein content (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 842). Breeding for a combination of grittiness with other characters is meeting with success at the Weibullsholm Plant Breeding Institution, Sweden. The present paper describes a micromethod of determining the degree of grittiness, suitable for breeding work.

1758. ÅKERMAN, Å.,
LINDBERG, J. E. and
AUGUSTIN, S.
Undersökningar av kvaliteten hos 1949 års brödsädesskörd. (**Investigations of the quality of the 1949 harvest of bread cereals**).
Sverig. Utsädesfören. Tidskr. 1950 : **60** : 385–414.

A report is given on the collection of the samples of wheat and rye from the 1949 harvest in Sweden; the numbers of samples, tabulated by districts and by varieties; and methods of analysis and the findings as regards purity of sample, broken grains, water content,

hectolitre weight, germination, percentage of sprouted grains, crude protein content and diastatic condition. The results of baking tests and flour quality determinations are also recorded as well as farinograph gradings of autumn and spring wheats.

1759. Tallarico, G.
La luce, il grano ed il pane. **(Light, wheat and bread).**
Riv. Ecol. 1950 : **1** : 115–19.

The theory of the contrast between northern and southern Europe, regarded as genetic environments (cf. *Plant Breeding Abstracts,* Vol. XX, Abst. 2197), is further developed to show that, while the sunlight of northern climates tends to promote starch formation in the wheat grain, the light from the sky in southern Europe promotes gluten formation.

1760. Mansfeld, R.
Das morphologische System des Saatweizens, *Triticum aestivum* L.s.l.
(The morphological system of bread wheat, *T. aestivum* L.s.l.).
Züchter 1951 : **21** : 41–60.

A key is given for the identification of the different botanical varieties. The synonyms and geographical distribution of the varieties are set out in a list. An alphabetical register of varieties is also included.

1761. Åberg, E.
Barley and wheat from the Saqqara pyramid in Egypt.
Kungl. LantbrHögskolans Ann. 1950 : **17** : 59–63.

Wheat and barley samples excavated at the Saqqara pyramid, dating from the third dynasty and about 5000 years old, are discussed. The wheats represent two species, *Triticum monococcum* and *T. dicoccum.* The barley discovered is classified as *Hordeum vulgare* var. *pallidum.* It is closely related to the Manchuria group. Attention is therefore drawn to a statement recently made by Thunaeus that the barley type termed Manchuria does not derive its name from Manchuria but instead from a village called Manshury in the Nile delta.

1762. Marinič, P.
(New varieties of spring wheat).
Kolhoznoe Proizvodstvo (Collective Farming) 1950 : No. **11** : 31–33.
[Russian].

Over 450 Soviet selected and local spring wheat varieties are still under trial. They include 124 new standards, the best of which are here described.
Albidum 3700 was obtained by individual selection at the Siberian Scientific Research Institute of Grain Farming. It has been made a standard for the steppe and wooded steppe districts of the Altaï and Krasnojarsk territories, the Burjat-Mongolian Autonomous Republic, and the Kemerov, Novosibirsk, Omsk and Čeljabinsk provinces. It is a mid-season variety yielding 15–20 c. per ha. The variety shows resistance to drought and is superior to Lutescens 62 and Noé in its resistance to lodging and shedding, resistance to rust and baking properties. The 1000 seed weight is 30–35 grm. However, the variety has recently been showing increasing susceptibility to loose smut.
The late maturing variety Milturum 553 was developed at the same institute as Albidum 3700. It shows resistance to drought and is more productive and less susceptible to lodging, shedding, pests and diseases than Milturum 321. It has been made a standard for the steppe and wooded steppe zones.
The variety Iskra [Spark] was selected from a local spring wheat at the Čeljabinsk Breeding Station. It yields 1·6 c. per ha. more and is two days earlier than Milturum 321. It has large grains, a 1000 of which weigh 34 grm., and their baking quality is good. Iskra has been made a standard for the steppe zones of the Kurgan and Čeljabinsk provinces.

Akmolinka 5 was developed by individual selection from a local wheat at the Šortanda Research Station. It has been made a standard for the steppe zone of the Akmolinsk province where it surpasses the former standard Hordeiforme 10 in yield. It is also less susceptible to drought, spring frost and pests than the former standard. The baking properties of the new standard are satisfactory.

Albidum 43 was bred at the Institute of Grain Farming for the south-eastern USSR. It shows resistance to drought and soil salinity and yields 1·2 to 2·5 c. per ha. more than other varieties cultivated in the south-eastern USSR. The grain is large but its baking properties are not altogether satisfactory. The variety shows resistance to rusts and surpasses the other varieties cultivated in the south-eastern provinces in resistance to lodging and shedding.

Tulun 70, developed at the Leningrad Breeding Station, has been made a standard in eight provinces in the Non-Black-Earth Belt, the Amur province and the Krasnojarsk territory. It yields 15–27 c. per ha., has good baking and milling properties and shows resistance to lodging. The variety is superior to Lutescens 62 in productiveness and resistance to brown rust.

Moskovka [Moscow], which has been made a standard for the Moscow province, was bred at the Institute of Grain Farming for the Non-Black-Earth Belt. It outyields Lutescens 62 by 4·6 c. per ha. It is a mid-season variety with good baking and milling properties, is resistant to lodging and shedding and tolerant of loose smut and brown rust.

Arnautka Nemerčanskaja is a hard wheat bred at the Nemerčanskaja Breeding Station. It has been made a standard in several provinces of the Ukraine. It yields 1·5–2 c. per ha. more than Melanopus 69. The variety is resistant to lodging and shedding and tolerant of loose smut and brown rust. It is susceptible to stem rust. The grains are large, a 1000 weighing 30–40 grm. The baking properties are good.

Narodnaja [People], developed at the Harjkov Breeding Station, has been made a standard for the Harjkov province. It yields 2·7 c. per ha. more than Melanopus 69. It is a mid-season variety showing resistance to drought, shedding and lodging and tolerance of loose smut and brown rust. It has large grains, a 1000 of which weigh 35–42 grm. The baking and milling properties are good. The variety shows promise for other Ukrainian provinces.

Odesskaja 13 [Odessa 13], bred at the USSR Institute of Breeding and Genetics in Odessa, has been made a standard for the Izmail, Nikolaev, Odessa and Herson provinces. It is more productive in these districts than any other soft wheat. The variety is mid-early and shows resistance to drought, bunt and smut and *Phytophaga*. The baking properties are good.

Artemovka was developed at the Stalino Breeding Station. It has been made a standard in several Ukrainian provinces. It is a mid-season variety showing resistance to drought, loose smut, brown rust and *Phytophaga*, has large grain with good baking properties and is more productive than Lutescens 62 and Melanopus 69.

1763. Maljcev, T.
(The development of spring wheat varieties tolerant of salinity).
Kolhoznoe Proizvodstvo (Collective Farming) 1950 : No. 9 : 25–26. [Russian].

Mičurinite methods of training wheats for tolerance of cold and soil salinity at a collective farm in the Kurgan province, Western Siberia, are described.

1764. Šestakov, V. E.
(The winter wheat Petrovskaja 7).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 7 : 73–74. [Russian].

A new promising winter wheat, Petrovskaja 7, was obtained by selection of Hostianum 122/76 (Lutescens 329 x Hostianum 237) at the Petrovskaja State Breeding Station. Petrovskaja 7 is more productive and has greater resistance to drought than the standard rye-wheat hybrid 46/131.

In trials at the Harjkov and Northern Donec State Breeding Stations Petrovskaja 7 proved resistant to lodging, brown rust and bunt. At each institute it outyielded the standard Hostianum 237.

1765. Ševčenko, F. P.
(Increasing disease resistance in spring crops by late autumn sowing).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 6 : 53–55. [Russian].

At Barnaul, Siberia, planting in late autumn, for a single season, of wheat, oats, barley and millet improved their resistance to various diseases. The spring wheat Milturum 321 became less susceptible to bunt, smut, *Fusarium* rot and glume blotch. The acquired resistance to diseases of the oat Pobeda [Victory] included reduced susceptibility to covered and loose smuts and crown rust, of the barley variety Europaeum 353/133 greater resistance to loose and covered smuts, and of the millet Veselopodoljanskoe 367 [Veselyĭ Podol 367], improved resistance to *Bacterium panici*.

1766. Karišnev, R.
(A winter form of wheat obtained from hybridizing spring wheats).
Agrobiologija (Agrobiology) 1950 : No. 5 : 135–37. [Russian].

The F_2 hybrids from *T. sphaerococcum* var. *rotundum* x Novinka [Novelty] at the White Russian State Breeding Station segregated some winter type plants. *T. sphaerococcum* var. *rotundum* and Novinka are normal spring wheats. So are Novinka's parents, Prelude and Preston. More winter type individuals were found in the F_3 and F_4. The seed was planted and selected for hardiness in the Saratov province. The surviving individuals included some plants which eared 11 days earlier and reached maturity 5 days earlier than Lutescens 1060/10, Ukrainka [Ukrainian], Hostianum 273, Erythrospermum 46/131 and Erythroleucon 76.
The early hybrids had smaller and less productive ears than Novinka but they had a remarkable capacity for producing tillers. Twelve plants have been selected for their productiveness, good tillering capacity and large well-formed grain.
As a result of continued selection of these some constant lines were obtained. Mention is made of 18 new forms morphologically resembling the female parent but showing greater earliness. They were obtained recently from the material at the Kalinin State Breeding Station.

1767. Ljaščenko, I. F. and
Ėsmont, A. M.
(Directed changes in plant organisms with shattered inheritance).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) Ser. Biol. 1950 : No. 4 : 44–56. [Russian].

In experiments conducted at the Azov-Don Biological Station of the Rostov State University the inheritance of several winter wheats was shattered by planting them as spring wheats. Afterwards the wheats were trained either as spring or winter wheats or as alternative wheats. The plant material consisted of Erythrospermum 3, 9, 12 and 4655 winter wheats, all developed at the Kirgizian State Breeding Station, and a local Armenian *Triticum vulgare* variety, Hamadanicum. As a result of directed training of the winter wheats with shattered inheritance remarkably productive lines of spring wheats and very hardy lines of winter wheats were obtained. Promising alternative forms were also developed by this method. These when grown as spring wheats produced higher yields if the seed from the winter crop was used.

1768. Hmelev, B. I.
(Grafting cereals by the method of transplanting embryos).
Agrobiologija (Agrobiology) 1950 : No. 4 : 126–32. [Russian].

Recent vegetative hybridization work with different economic plants in the USSR is briefly surveyed. Mention is made of a new hardy winter wheat, still under trial, which was obtained by V. F. Illarionov by grafting a young shoot of wheat on the endosperm of another cereal plant.
The causes of the unsatisfactory results of grafting embryos on endosperms in cereals were examined at the USSR Institute for Sugar Beet in Kiev. The results of the experiments, which included the following grafts, are reported: Umanskiĭ [Umanj] barley embryos on Umanskiĭ endosperms and on the endosperms of Lutescens 62 spring wheat; Umanskiĭ barley embryos on Melanopus 69 spring wheat endosperms; Lutescens 62 wheat embryos on wheat endosperms of Melanopus 69; Gruševskiĭ embryos on Lutescens 62 wheat endosperms; various hard and soft wheat scions on barley endosperms; and the embryos of the *Triticum turgidum* sample 17720 of the Institute of Plant Industry on endosperms of Lutescens 62 and on endosperms of 17720.
The rate of survival of the grafted hybrids is associated with their capacity for early shooting and for vigorous growth after reaching the shooting phase.

1769. Ždanov, A. P.
(The winter wheat Odesskaja 3 in the Stavropolj territory).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 7 : 65–67. [Russian].

As a result of state tests in 1948 the winter wheats Hybrid 481, Novoukrainka 83 [New Ukrainian 83] and Pervenec [First Born] superseded several former standards for the Stavropolj territory. Other varieties which proved superior to some standards but have not yet been released as standards themselves included Odesskaja 3 [Odessa 3]. This variety was bred from Kooperatorka 194 [Cooperator 194] x Hostianum 237 at the Lysenko Institute of Breeding and Genetics in Odessa. Odesskaja 3 shows remarkable resistance to drought which makes it in some districts more productive than Vorošilovskaja [Vorošilov].

1770. Lyle, J. A.
Diseases of small grains in Alabama.
Plant Dis. Reporter 1950 : **34** : 318–20.

Information is provided on the reaction of wheat varieties to powdery mildew, leaf rust and *Septoria* leaf blotch and of oat varieties to *Helminthosporium Avenae*, *H. Victoriae* and crown rust in Alabama during the season 1949–50.

1771. Middleton, G. K. and
Hebert, T. T.
Atlas wheat. Strains 50 and 66.
Spec. Circ. N.C. Agric. Exp. Sta. 1950 : No. 8 : Pp. 8.

Two new strains of wheat, Atlas 50 and Atlas 66, are reported from the cross Frondoso x (Redhart 3 x Noll 28). Both strains have given high yields in the non-mountainous areas of North Carolina and neighbouring states. The straw is exceptionally stiff and well adapted to combining and the grain is of satisfactory milling and baking quality, maturing a week later than Redhart. Atlas 50 is resistant to mildew and fairly resistant to leaf rust; Atlas 66 has shown a high degree of resistance to leaf rust and fair mildew resistance; both are resistant to stem rust. They are easily recognized by their compact heads spreading slightly towards the apex.

1772. Winter, A. G.
Untersuchungen über die Ophiobolose-Resistenz eines deutschen Weizensortiments. (**Investigations on the *Ophiobolus* resistance of a German wheat collection**).
Z. PflKrankh. 1949 : **56** : 191–98.

Seedlings were infected by Garrett's method with single-spore cultures of *O. graminis* and the hyphal development on the roots estimated after 10 and 14 days. The most resistant of the 20 varieties tested was Rimpaus Braunweizen [Rimpau's Brown wheat], in which the hyphae never reached the base of the haulm or the ends of the roots during the first 19 days after infection.
When older plants were tested, Rimpaus Braunweizen was one of the most susceptible and many of the varieties previously classed as susceptible proved resistant.

1773. Bellod, M.
Notas sobre el "mal de pie" de trigo en la huerta valenciana. (**Notes on foot rot of wheat in Valencia farms**).
Bol. Pat. Veg. Ent. Agríc., Madr. 1946 : **14** : 55–68.

The varieties Fartó and Mocho have exhibited relative freedom from attack by *Ophiobolus graminis*, though the author considers that neither variety has been sufficiently studied to guarantee its immunity.

1774.
(**On the report of the Institute of Grain Farming for South East USSR**).
Agrobiologija (Agrobiology) 1950 : No. 4 : 171–76. [Russian].

Mičurinite changes in the work conducted at the Institute are reported. The following notes on breeding work are included.

Wheat
A new variety of soft spring wheat, Saratovskaja 29 [Saratov 29], has been developed. It is more productive than Lutescens and shows resistance to loose smut, yellow rust and frit fly. The variety is being multiplied while still under trial.
A new spring standard Albidum 43 is being bulked for seed.
A new winter wheat, Lutescens 230, superior to Lutescens 329, has been bred.
Breeding hardy winter wheats is in progress, the methods comprising intervarietal hybridization and directed training and trials of the Siberian varieties obtained from training of spring wheats as winter wheats. The Mičurinite techniques include the cultivation of spring wheats upon sward and of winter wheats upon stubble.

Rye
A new winter variety Volžanka [Volga] is being tried and improved. The variety is productive and hardy under local conditions. It was developed from the best lines of the local variety Eliseevskaja open-pollinated with various selected varieties.

Maize
Experiments with hybrid maize include the study of heterosis in the F_2.

Sunflower
Hybrid plants showed heterotic effects in trials with their initial varieties.

1775. Johnston, C. O.,
Quisenberry, K. S. and
Reitz, L. P.
Reaction of hard red winter wheats to bunt in uniform bunt nurseries (1943-1947).
Agron. J. 1951 : **43** : 61–66.

The results of nursery tests of varieties and strains of hard red winter wheat for reaction to *Tilletia foetida* and *T. caries*, carried out at many stations on the Great Plains between

1943 and 1947, are given in tabular form; the inoculum for each station consisted of a mixture of the physiological races of *Tilletia* known to occur naturally in the area. Although no variety was immune, resistance to races of ordinary bunt was high in selections derived from the variety Oro; many hybrid lines with an average infection below 10% in respect of dwarf bunt had the variety Martin in their parentage as a source of resistance. Numerous wheat strains are resistant to both types of bunt and are available for further breeding.

1776. Pugsley, A. T.
The resistance of Oro and Orfed wheats to *Tilletia caries* and *Tilletia foetida*.
Aust. J. Agric. Res. 1950 : **1** : 391–400.

A genetic analysis of the resistance of Oro and Orfed wheat varieties to race T5 of *Tilletia caries* and races L1, 3 and 14 of *T. foetida* was made at the Waite Agricultural Research Station by (1) studying the segregation occurring in the F_2 of the cross Oro x Rapier, measured by the frequency distribution of infection in F_3 populations, and (2) seeking homozygous segregates, which might exhibit differential reactions to the four races, over seven generations derived from Oro x Rapier and Orfed x Dirk crosses. Both Rapier and Dirk are susceptible varieties grown commercially in South Australia.
Inheritance in the Oro x Rapier cross was not of a simple nature; several selections were made which showed marked differential reactions to the four races. Although it was presumed that Orfed possessed the same factors for resistance as its parent Oro, a consistent difference in susceptibility to L1 was detected. Several back cross selections from the Orfed x Dirk crosses, using Dirk as the recurring parent, showed a resistance superior to that of Orfed.
In both series of crosses selections with high resistance to races L1 and 14 were obtained, having, at the same time, susceptibility to T5 and L3.

1777. Munnecke, D. E.
Effect of wheat juices on urediospore germination of *Puccinia graminis tritici*.
Phytopathology 1951 : **41** : p. 27. (Abst.).

Leaf saps from several wheat varieties were added to agar plates on which five races of *Puccinia graminis* var. *Tritici* were germinated. The percentage germination varied with the races of *Puccinia* and was not correlated with the resistance or susceptibility of the wheat varieties.

1778. Ward, D. J.
Rust reactions of selected spring wheats.
Division of Cereal Crops and Diseases, US Department of Agriculture 1950 : Pp. 3. (Mimeographed).

See Abst. 1779.

1779.
Report of the Wheat Stem Rust Conference at University Farm St. Paul, Minnesota November 17-18, 1950 : Pp. 53. (Mimeographed).

Stakman, E. C. *History, prevalence and distribution of stem rust race 15B.* (*p. 1*).

Information is given regarding the history, prevalence and distribution of race 15B of *Puccinia graminis* which was the most virulent race of stem rust in America in 1950.

Peterson, R. R. and Campbell, A. B. — *Breeding wheat for stem rust resistance with particular reference to physiologic race 15B.* (*pp. 6–7*).

In attempts to obtain resistance to *P. graminis* in western Canada, varieties such as Redman, Thatcher, McMurachy, Frontana and RL 2265 (McMurachy x Exchange) have been incorporated in numerous crosses. These varieties are known to have some degree of general resistance to all stem rust races under certain conditions. The variety RL 2520, derived from Frontana x (RL 2265 x Redman^2), has shown a much higher degree of resistance to all stem rust races, including 15B, than either of the parental varieties.

Johnson, T. — *Reaction of wheat varieties to race 15B.* (*pp. 8–10*).

After summarizing the information available in 1949, the results are reported of greenhouse tests with adult plants and seedlings and of the 1950 field tests at Winnipeg. In the field tests, Red Egyptian, McMurachy and McMurachy x Exchange derivatives were generally free from infection. Previous tests, with 20 varieties, for seedling resistance to race 15B are being repeated as it is not certain whether the race so common in the 1950 summer can be identified with former cultures. At about 80° F. Frontana and RL 2520 were the only resistant varieties.

Ausemus, E. R. — *Progress of breeding for stem rust, with particular reference to race 15B, at St. Paul, Minnesota.* (*pp. 10–12*).

At St. Paul, Minn., the main sources of resistance to race 15B of *P. graminis* have been the varieties Kenya 58 and 117A, Red Egyptian, Cadet, Surpresa and Frontana. The results of numerous crosses are tabulated; several hybrids resistant in the seedling stage have been produced, and selections which appear to be resistant in the adult plant stage are available. Greatest resistance has been obtained in derivatives of Frontana.

McNeal, F. H. — *Stem rust in Montana.* (*p. 13*).

None of the breeding material used in Montana has been tested for resistance to *P. graminis*, as stem rust is of minor importance in this state; several selections from crosses involving Frontana, Timstein, Chinese and Frondoso may possess resistance.

Waldron, L. R. — *History of amphiploid wheat breeding and some results.* (*pp. 13–15*).

Selections from the F_2 of derivatives of colchicine induced amphiploids crossed with NS 3144 were next crossed with Newthatch, producing offspring with many segregations. Some of their characteristics, in particular, yielding ability, resistance to smuts and rusts and baking quality of flour, are described; they compare favourably with the variety Lee. Although numerous selections proved promising, very few have shown resistance to race 15B of *P. graminis*; further tests are being made with selections 45.1.5 and 1.5.16.1 and 1.5.16.2 which have immunity from loose smut and a high degree of resistance to race 15B of stem rust.

Some of the F_4 progeny of crosses between Lee and two sibs of Mida (3175 and 3264) have shown a higher degree of rust resistance than the parent varieties.

Heerman, R. M. — *Present status of breeding for resistance to stem rust race 15B in durum wheat.* (*pp. 15–18*).

None of the durum wheat varieties growing in North Dakota on field plots or advanced nurseries was resistant to race 15B of *Puccinia graminis*. Tables are presented of the degree of infection observed in each variety but any differences are too small to be significant. Late maturing durum varieties are exposed to rust attack for a longer period and their yields are consequently lower than many earlier varieties with less resistance.

Selections from the cross Ld. 308 x Nugget are being tested; it is hoped that the earliness of Nugget will be combined with the high degree of rust resistance of Ld. 308.

Introductions from Russia (PI 94701) and Tunisia (CI 3255) have shown considerable resistance; quality tests are being carried out. Some of the F_4 generations from the two crosses Ld. 271 x Khapli and Ld. 194 x Khapli showed a high degree of resistance to race

15B but further back-crossing to durum parents is required. The varieties Ld. 308 and Ld. 306 have been crossed with Ld. 194 x Khapli and F_2 seedlings are undergoing tests for resistance, after which they will be back-crossed with durum varieties.

Shands, R. G. *Wisconsin wheat stem rust in 1950.* (*pp. 19–22*).

The varieties Blackhawk and Henry were sufficiently resistant to the mild attacks of stem rust which occurred in Wisconsin during 1950. Reactions to races 17, 19 and 56 of *Puccinia graminis*, recorded from artificially induced epidemics, are presented in tabular form. Those varieties with a high degree of stem rust resistance are McMurachy, Kenya CI 12186, Red Egyptian, Kenya CI 12471 and 12568, Egypt Na. 95 and Klein 33 PI 116222; it appears that these varieties would form a promising basis for a breeding programme with the inclusion of additional material from hybrid lines involving Surpresa, Frontana and *Triticum Timopheevi* in order to incorporate resistance to race 15B.

Caldwell, R. M. *Breeding soft winter wheats for stem rust resistance.* (*pp. 22–24*).

Breeding for resistance to races of stem rust has received comparatively little attention in the soft winter wheat region. Lines deriving resistance from Hope-Hussar are reported, but it is presumed that they are susceptible to race 15B. Immune or highly resistant progeny have been obtained from a Trumbull x *Agropyron elongatum* cross and the resistance has been maintained in selections from back crosses with soft red winter wheat varieties; their reaction to race 15B is being investigated.

Johnston, C. O. *Present status of breeding for stem rust resistance in Kansas.* (*pp. 24–26*).

Breeding for stem rust resistance in Kansas has been conducted in conjunction with resistance to leaf rust, so that complex crosses have been necessary to combine resistance to several races of both pathogens. Crosses have involved the varieties Hope, McMurachy, Red Egyptian, Kenya RL 1373, the interspecific cross *T. vulgare* x *T. Timopheevi* and the intergeneric crosses *T. vulgare* x *Agropyron elongatum* and *T. vulgare* x *A. trichophorum*. Although the incidence of stem rust race 15B is slight, several selections have been sent to St. Paul, Minn., for reaction tests; Chinese[2] x *A. elongatum*, Egypt Na. 101 x (Hope x Cheyenne) and (Bobin[2] x Gaza) x Pawnee have shown a high degree of resistance at 60–70° and 80–85° F.

A culture of stem rust race 15 B has been obtained for tests in Kansas where material from Texas, Oklahoma, Colorado and Nebraska is to be investigated in addition to progeny from crosses carried out at Manhattan, Kans.

Reitz, L. P. *Hard winter wheat improvement with special reference to stem rust resistance.* (*pp. 26–28*).

The general principles of breeding for resistance to stem rust are outlined. In Nebraska the material used in numerous crosses has included Hope, H 44, *T. Timopheevi*, Timstein, Marquillo, Frontana and *Agropyron* x *Triticum* progeny. Other introductions from Mexico, Minnesota and Kansas are to be incorporated.

Atkins, I. M. *Present status of breeding for resistance to race 15B of stem rust of wheat in Texas at Denton, Texas.* (*pp. 28–29*).

Studies of disease resistance in Texas have been carried out in the field using natural infections. The varieties Quanah and Supremo are resistant to many races of stem rust but breeding for resistance to race 15B is continuing. Selections are being made from crosses of Comanche x Red Egyptian, Red Egyptian and Frontana with promising local strains of commercial varieties, and bulk hybrids involving the Canadian strain RL 2325 [(McMurachy x Exchange) x Redman[3]] crossed with the commercial varieties Tenmarq, Comanche and Triumph.

McFadden, E. S. — *Parental material resistant to race 15B.* (*pp. 29–31*).

Several pure line selections have been obtained at the Texas Agricultural Experiment Station from crosses with plants carrying genes for resistance to many races of stem and leaf rust.

Resistance to race 15B which has been found in Maria Escobar and other Latin American wheats and in McMurachy and Kenya varieties will be combined with the characteristics of Hope and its derivatives by crossing and back-crossing.

A few Renacimento x Kenya selections will be used to produce spring wheat varieties with resistance to frost in the seedling and tillering stages; this characteristic is not found among the Hope derivatives. Additional selections from Frondoso x Kenya and Fronteira x Kenya are to be used for breeding winter wheats with resistance to all virulent stem and leaf rust races and possibly resistance to the Hessian fly.

Borlaug, N. E. — *Summary of sources of stem rust resistance found in Rockefeller Foundation wheat breeding program in Mexico.* (*pp. 31–34*).

The reaction of Mexican wheats to various races of stem rust has been tested by artificial inoculation at St. Paul, Minn., and natural infection at Langdon, N. Dak. Resistance to races 11, 15B, 17, 38 and 56 at moderate temperatures has been found in the crosses Kenya x Mentana, Kenya x Mentana^2 and Supremo x Kenya.

Rodenhiser, H. A. — *Reaction of wheats to stem rust in cooperative nurseries.* (*pp. 34–37*).

Conditions during 1950 in the Spring Wheat Uniform Rust Nurseries are discussed in respect of rust epidemics. Significant data for race 15B were obtained at Langdon, N. Dak., where McMurachy was the only variety remaining free from attack. The severity of stem rust infection on 40 varieties at different nurseries is reported in tabular form.

Ward, D. J. — *Rust reactions of selected spring wheats.* (*pp. 38–43*).

The reactions of over 60 selected spring wheats to stem and leaf rusts in six states are summarized in tabular form, with an additional list of varieties of different types of wheat which the conference group has suggested for use as parents in breeding new varieties resistant to race 15B of stem rust.

Ausemus, E. R. — *Measures underway to meet the emergency.* (*pp. 43–45*).

The measures being undertaken to limit the losses due to race 15B of stem rust are discussed and summarized.

Johnson, T. — *Selfing studies with wheat stem rust cultures belonging to the race 15 group.* (*pp. 48–49*).

The results of inoculations with cultures regarded as race 15, from which numerous infection types in addition to the original parent type developed, emphasize the heterozygous nature of the race 15 group.

Bayles, B. B. — *Plans for future investigations.* (*pp. 45–47 and 50–52*).

Plans for organizing yield and disease resistance tests on a regional and international basis and various proposals concerning breeding, put forward by the conference members, were discussed. The need for caution with artificial field inoculations of race 15B of stem rust was stressed by J. G. Dickson; it was decided to limit these tests to St. Paul, Minn., and Winnipeg, Man. Attempts to find a less virulent race of stem rust, already prevalent, which can be used to locate wheats resistant to race 15B were reported by B. B. Bayles.

J. G. Dickson suggested that coordinated research should be undertaken to determine (1) the genetics of rust resistance in wheat, (2) the genetics and pathogenicity of rust races and their response to environmental conditions, and (3) additional testing techniques. Numerous proposals were made concerning the need for determining the genetical relationships of the pathogen and the host. K. S. Quisenberry outlined the proposed additional research on stem rust by the Cereal Division of the United States Department of Agriculture.

1780. Loegering, W. Q.
Survival of races of wheat stem rust in mixtures.
Phytopathology 1951 : **41** : 56–65.

In studies of the prevalence of races 17, 19 and 56 of *Puccinia graminis* var. *Tritici* in North Dakota it was found that their seasonal and geographical distribution on susceptible varieties is dependent on relatively minor ecological factors combining to affect their differential development and survival; the ability of races to multiply in mixed populations is not due to degree of virulence alone.

1781. Waldron, L. R.
A plant breeder works with 15B.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1951 : **13** : 126–28.

Some selections from crosses of the colchicine-induced amphidiploid of *Triticum Timopheevi* and *Aegilops squarrosa* with common wheat show promising resistance to the new race 15B of stem rust.

1782. Grim, G. R. and
Dickson, J. G.
Developmental cytology of *Puccinia graminis tritici* races 56 and 15B on seedlings of Hope and *Triticum timopheevi*.
Phytopathology 1951 : **41** : p. 15. (Abst.).

Uredial development after inoculation of ten-day seedlings with the two races of *P. graminis* var. *Tritici*, at various temperatures, was related to the cellular reactions of host and pathogen. Hope and *Triticum Timopheevi* developed infection types 3+ and 3—, respectively, with race 15B. Cytological observations showed a greater compatibility reaction between host and mycelial cells at 16° C. than at 28°. Race 56 produced infection type 2 at 16° and type 3 at 28° on the variety Hope; an initial hypersensitive reaction was observed, followed by a semicongenial relationship occurring 3 days after infection at 28° and after 5 days at 16°. The high resistance of *T. Timopheevi* to race 56 at both temperatures was seen as a complete incompatibility reaction between the mycelium and host.

1783. Clark, J. A.
Wheat varietal surveys, North Dakota—1949.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1950 : **13** : 24–28.

The five leading hard red spring varieties in North Dakota during 1949 were Mida, Thatcher, Rival, Cadet and Regent, in the order listed. Stewart, distributed in 1943, was the leading durum wheat in 1949. The new stem rust resistant varieties should cause rapid changes in the varietal situation. Hard red spring wheats approved for quality comprise Cadet, Mida, Newthatch, Pilot, Redman, Regent, Rival, Rushmore and Thatcher. The rust resistant durum varieties Stewart, Carleton and Vernum should gradually reduce the acreage of the old rust resistant variety Pentad and susceptible wheats.

1784. Vilmorin, M. de and
Martin, P.
Les échelles de notation de la rouille noire et les dégats causés par celle-ci dans les blés en 1950. **(The grade scores of black rust and the damage caused by it among wheats in 1950).**
C.R. Acad. Agric. Fr. 1950 : **36** : 652–55.

The wheat improvement programme at Verrières, France, includes a search for spring wheats and alternative wheats for large scale cultivation, as well as the production of early wheats for the south and south west. To attain these aims it will be necessary to breed for a high degree of resistance to the different biological races of rust known in France. A survey is given of the degrees of resistance or susceptibility of numerous varieties, including autumn, spring and alternative wheats in the various regions of the country. The scoring notations used by Guyot at Grignon and by the writers at Verrières are set out. A further survey of the various biological races of rusts in the country will be necessary.

1785. Miyake, M.
(The genetics of resistance to yellow mosaic disease in wheat varieties).
Jap. J. Genet. 1942 : **18** : 192–95. [Japanese].

Hybridization studies with Japanese wheats have demonstrated the existence of two dominant genes R_1 and R_2 for yellow mosaic resistance. R_1 is carried by varieties Shinchucho [New Mid-long] and Tochigiseki 1 [Tochigi Red 1], while R_2 is borne by Norin 7 [Ministry of Agriculture and Forestry 7].

1786.
Notes from Boghall—III.
Scot. Agric. 1950–51 : **30** : 177–79.

Varietal trials of spring and winter wheats, spring barley and spring oats with respect to early maturity and high yields have continued at Boghall.

BUCKWHEAT

1787. Noguti, Y. and
Sugawara, T.
(On the autopolyploids of buckwheat and the sunflower).
Jap. J. Genet. 1942 : **18** : 117–18. [Japanese].

Studies are reported on colchicine-induced tetraploids and octoploids of buckwheat and tetraploids of the sunflower. Data are given on the stem height, leaf area and thickness, stomatal size and frequency, flower size, pollen grain size, number of days till flowering, number and weight of seeds per plant, and the seed weight of the polyploids and of the parent diploids.

1788. Sinoto, Y. and
Sato, D.
(Buckwheat polyploids induced by colchicine).
Bot. and Zool. 1939 : **7** : 1398–402. [Japanese].

An extended version of this paper in Italian has been summarized in *Plant Breeding Abstracts*, Vol. XVII, Abst. 676.

1789. Petelina, N. N.
(Methods for producing buckwheat varieties giving high and regular yields).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. **7** : 37–41. [Russian].

Two productive varieties with good quality grain have been developed at the Alexandrovskaja Breeding Station, Vladimir province.

Alexandrovskaja 134 has a 10% higher yield than Kazanskaja [Kazanj], and Ivanovskaja has a 22% higher yield than Kazanskaja. However, the yielding capacity of the new varieties fluctuates according to seasonal conditions as does the yield of other buckwheats grown in the Vladimir province.
As a result of investigations into the grain setting capacity of Kazanskaja, new criteria for breeding for productiveness are recommended. These include selection for definite stem and leaf characters. It was found that non-branching single stem forms or forms with the stems divided into two long branches had a better fruit setting capacity than forms with short branches or with more than two long branches. Within the group of Kazanskaja plants selected for their stem characters, further selection was carried out for forms whose leaves dry at harvest. A smaller proportion of control plants yielded 51 to 100 grains per plant than plants having dry leaves, and yields of over 100 to 400 grains were only recorded for individuals with the dry leaf character. In these experiments other varieties of buckwheat not previously selected for stem characters were included. Mičurinite training and selection of Alexandrovskaja 134 and Ivanovskaja and the hybrids of Kazanskaja are in progress. Breeding work with these and other buckwheats involves vegetative hybridization which is expected to give productive new forms with the dry leaf character, desirable grain properties and resistance to shedding. The most promising components for direct and reciprocal grafts include Ivanovskaja, which is remarkable for earliness and resistance to drought and has a thin testa, and a tetraploid developed at the Institute of Cytology of the USSR Academy of Sciences. This tetraploid has a low yield and reaches maturity late under conditions in the Vladimir province, but it has large grain and shows resistance to shedding.

OATS

1790. Hagbert, N. O.
Weibulls original Bambuhavre II. (Weibull's Bambu II oats).
Weibulls Årsb. 1950 : p. 6.

The original Bambu oat was isolated from a cross of two strains with Seger [Victory], Stormogul [Great Mogul] and Abundance in their ancestry. In the course of repeated selection to render the Bambu variety, already on the market, completely constant, a selection W 14535 was observed to differ markedly from the parent variety and is ultimately to be released in 1951 as Bambu II. It has fine white grain of particularly good quality with high hectolitre weight and low husk content and equals Bambu in 1000 corn weight. It yields more than Bambu and ripens three days earlier than Guldregn [Golden Rain], but from one to two days later than Bambu. It has exceptionally strong straw, and is recommended for cultivation in all Götland and Svealand as well as the more favourable parts of southern Norrland.

1791.
New Mustang oats, developed in Texas, resist crown rust and survive cold winters.
Crops and Soils 1951 : 3 : No. 5 : p. 26.

Developed from a cross between Fulwin and a selection of Lee x Victoria, the new oat Mustang is being distributed to farmers in Texas; it is winter hardy, highly resistant to crown rust, and suitable for both winter pasture and grain production.

1792. Marcenicina, K. K.
(The development of different forms of wild oat from the cultivated oat).
Agrobiologija (Agrobiology) 1950 : No. 4 : 60–64. [Russian].

In experiments at the Falenki State Breeding Station the development of fatuoids in several varieties of oats was investigated. The evidence showed that the cultivated

plump grained, hulled and naked varieties may give rise to other forms of wild oat than *Avena fatua* ssp. *cultiformis*.
The wild oat is regarded not as an initial form in the evolution of the cultivated oat but its derivative.

1793. Hübner, R.
Vierjährige Untersuchungen über Kornqualität und Leistungseigenschaften des Hafers. I. Teil: Morphologisch-physikalische Untersuchungen. (Four year investigations of grain quality and performance characteristics of oats. Part I. Morphological and physical investigations).
Z. Acker- u. Pflanzenbau 1950 : **93** : 44–78.

The author's aim was to obtain information concerning all the determinable characteristics of the grain of 10 varieties, which included white and yellow oats. Amongst the characteristics measured were the yields of grain and straw, the percentage of husk and the effect on it of annually changing conditions, the length and thickness indices of the grains and the 1000 corn weight.

1794. Bartley, B. G. and
Weiss, M. G.
Evaluation of physical factors affecting quality of oat varieties from Bond parentage.
Agron. J. 1951 : **43** : 22–25.

In experiments carried out in Wisconsin and Iowa during 1947 and 1948, quality was investigated in the four standards Marion, Gopher, Richland and Tama and in 19 varieties having Bond as one parent. Data on hull percentage, test weight per bushel, per cent bosom kernels and 100 kernel weight were obtained. Considerable varietal differences were shown in all four characters. Using hull percentage as the main criterion of quality, Benton, Sac, Andrew, Advance and Colo had appreciably higher quality than Clinton (D 69 x Bond). Test weight per bushel was positively correlated with 100 kernel weight and yield; kernel weight and yield were also positively correlated. Significant negative correlations were obtained between hull percentage and kernel weight and between hull percentage and yield in the early varieties but not in the midseason oats. The characters of primary kernels were closely associated with those of secondary kernels; either class would have been effective for grading the varieties.

1795. Peturson, B.
Recent changes in the relative prevalence of physiologic races of crown rust in Canada.
Phytopathology 1951 : **41** : p. 29. (Abst.).

The recent increase in the prevalence of races 34, 45 and 57 of *Puccinia coronata* in Canada coincides with an increase in acreage, in the USA, of new oat varieties, possessing the Bond type of crown rust resistance.

1796. Rosen, H. R. and
Murphy, H. C.
A race of crown rust of oats apparently new to the United States.
Phytopathology 1951 : **41** : p. 31. (Abst.).

A race of *Puccinia coronata* was discovered recently in Arkansas; it resembles race 55, previously found only in Argentina. Many varieties grown in the USA are susceptible, including Bond, but the following are resistant: Ukraine, Landhafer, Rainbow, Santa Fe x Clinton CI 5400, Shands' CI 4508 and Rosen's selections of R 22–36b–9.

1797. Earhart, R. W.
***Helminthosporium* crown and culm rot of Southland oats.**
Phytopathology **1951** : **41** : p. 11. (Abst.).

Severe lodging and symptoms of *Helminthosporium* crown and culm rot, which occurred in the 1949–50 season after the release of the resistant variety Southland in Florida, were due to an inidentified *Helminthosporium* organism. The isolated fungus resembles *H. Victoriae* and *H. sativum* in certain morphological characters but is pathologically distinct. There are differences in host varietal response to single spore isolates.

1798. Åkerman, Å.
Hur skall man åstadkomma rikare havreskördar? (**How shall one obtain more abundant oat harvests?**)
Lantmannen **1951** : **35** : 43–45.

Two suggestions for increasing oat harvests in Sweden are: the use of (1) varieties that have been bred for suitability to various regions; and (2) varieties resistant to insect pests, especially the frit fly. Among the varieties resistant to this pest the new Kalmar oat K 01509, the new Svalöf variety 01632 and Blenda (cf. Abst. 255) are specially mentioned. Yields, earliness and regional adaptation are briefly considered with reference to various Scandinavian and Finnish oats, including Örn [Eagle] and a new élite E, Stjärn [Star], Trio, Bambu, Vidar, Primus II and Orion III (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 1555).

1799.
Notes from Auchincruive—III.
Scot. Agric. **1951** : **30** : 233–36.

Information is given on the performance of the oats Ayr Commando and Minor in comparison with the control variety Yielder in the 1950 and previous trials at Auchincruive, west Scotland; tests on strains of fodder beet and swede; and trials on grass strains.

1800.
Report on oat variety trials.
Mon. Rep. Minist. Agric. N. Ire. **1951** : **25** : 266–70.

Data are presented from the varietal trials of oats at numerous centres in Northern Ireland during the 1949–50 season. Two distinct series on fertile and poorer soils were conducted. The varieties Stormont Arrow and Crown were used as standards on fertile soils, against which Stormont Iris, Sun II or Steel, Glasnevin Triumph, S 84, S 225 or Milford, Stormont Grandee and Abed Minor were compared. The varieties tested on poorer soils comprised Stormont Kern, Tyrone Tawny, Ayr Line, Stormont Grandee, Utility and Ayr Bounty. No definite regional superiority has been shown so far by any of the varieties.

RYE

1801. Waller, E.
30 års jämförande sortförsök med höstråg vid Sveriges Utsädesförenings Västgötafilial, Skara. (**Thirty years of comparative variety trials with autumn rye at the Västgöta Branch Station of the Swedish Seed Association, Skara**).
Sverig. Utsädesfören. Tidskr. **1950** : **60** : 371–79.

The course followed from 1920 onwards by the Västgöta Branch Station of the Swedish Seed Association in rye improvement work in collaboration with the main institute at Svalöf and other branch stations of the Association is outlined. The advances that have resulted from the long series of variety trials are evident from the tables showing the performance of rye varieties and selections and the land races, tested for yield of grain and

straw, strength of straw, hectolitre weight and 1000 corn weight, tendency to sprouting in the ear, winter hardiness and grain quality.

1802. Schad, C.
L'amélioration du seigle. **(The improvement of rye).**
Ann. Nutrit. Aliment., Paris 1948 : **2** : 87–103.

As factors in breeding rye in France, the biology of flowering and the influence of inbreeding and of heterosis are considered. The production of new varieties by continued mass selection or by crossing of inbred lines is referred to, the second method being exemplified by the rye Grand Grouelle derived from complex hybridization of inbred progenies of the varieties Petkus, Krafft's Zélande and the local rye of the Clermont-Ferrand region. Grand Grouelle equals Petkus in yield, Zélande in earliness, and the local ryes in quality of straw and hardiness, while at the same time surpassing them in resistance to lodging (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 1258).
Among the problems to be considered in a rye breeding programme for France, mention is made of the possible combination of productivity with kernels lacking the greenish tint and superior in grain quality. Other aims might be: the production of perennial ryes with a high yield of forage and the creation of an awnless or soft-awned type. Incidentally, the many-stemmed Saint-Jean rye is still in use as a source of green fodder.

1803. Ferwerda, F. P.
Enkele waarnemingen over inteelt en heterosis bij rogge. **(Observations on inbreeding and heterosis in rye).**
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) **30** September, 1948 Wageningen : 226–29. (Mimeographed).

During recent years the Dutch Plant Breeding Station has been recording observations on inbreeding and heterosis amongst Swedish inbred lines, since those of Mayer Gmelin were lost or hybridized by uncontrolled pollination during the occupation. Just recently Vervelde has succeeded in purifying them.
Artificial crossing of two inbred lines, after emasculation, results in an F_1 showing heterosis. Its reproduction on a large scale, by planting two inbred lines adjacent in an isolated area, leads to difficulties. Some self pollination always occurs. It is often assumed that because of the marked self incompatibility of rye, cross pollination will predominate. But this is not so. The F_1 individuals usually fall into two sharply divided groups: poorly developed specimens strikingly resembling the mother line and well developed individuals. Although not experimentally proved, the former are considered to be the product of self pollination, while the latter are most probably crossed. The proportion of the two types is very variable. Some lines give 90% inbreds; others produce a majority of hybrids, and there are all degrees between these extremes. Three classes are recognized: lines with a preference for selfing; those with a preference for crossing; and some that are indifferent. In breeding inbred lines selection is for self fertility, whereas for heterosis it is those lines that have a distinct aversion to their own pollen that are required. Rapid information concerning the pollination character of the lines can be obtained by planting them in the middle of a field of rye and studying the offspring.
In the discussion, Koopman remarked that in America a team is at work propagating beet on a large scale vegetatively because the set of seed is so bad and self sterility is common. This technique will be difficult with rye.

1804. Müntzing, A.
Cyto-genetic properties and practical value of tetraploid rye.
Hereditas, Lund 1951 : **37** : 17–84.

A detailed report is given of investigations on meiosis, somatic chromosome numbers, cell size, vegetative and floral characters, fertility, physiological and chemical characters, and yield of grain and straw in seven tetraploid rye varieties and material obtained by intercrossing tetraploids. Most of the tetraploids were induced by colchicine treatment.

Cytologically rye behaves as a true autotetraploid, producing a high frequency of quadrivalents at metaphase I, the average values per cell ranging from 3·80 to 4·05 in the four varieties analysed. Anaphase I is somewhat irregular, with dividing univalents and other deviations from the normal distribution of 14–14. The divided univalents lag at anaphase II, resulting in a rather high frequency of micronuclei. The frequency of micronuclei in the tetrads is a good indication of the degree of meiotic irregularity and frequency of aneuploids. Selection for increased fertility exerted little or no effect upon the mode of chromosome pairing at meiosis.

Somatic chromosome numbers were studied in 808 plants. Of these 77·23% had $2n = 28$; the next numbers in frequency were 29 and 27, being represented by 13·12 and 7·43% respectively; more extreme deviations were rare.

Pollen cell size is greater in the tetraploid form than in diploid rye.

From the practical point of view, the best tetraploid strains are equal to the corresponding diploids in yield, stiffness of straw, earliness, and resistance to frost and drought. The equality in yield is the outcome of two positive and four negative properties of tetraploid rye. The positive characters are the large kernel, 53% heavier than the diploid, and superior sprouting ability. The negative characters comprise: (1) a reduction in the percentage of seed setting compared with diploid rye, ranging from 20 to 25%; (2) reduction in tillering; (3) lower number of flowers per spike; and (4) greater tendency to shed the basal spikelets before maturity.

The present tetraploids have three disadvantages: the straw is too tall for combine harvesting; the increase in kernel size necessitates the use of larger quantities of seed for sowing; and finally, in order to avoid reduction in seed setting tetraploid rye must be grown in isolation from diploid rye.

Pollen fertility is apparently normal in the tetraploids, most plants giving 90–100% morphologically good pollen. A marked barrier of incompatibility exists between tetraploid and diploid rye. Fertilization readily occurs in $4n$ x $2n$ and $2n$ x $4n$ crosses, the low seed setting obtained being due to irregularities in endosperm development and subsequent death of the embryos. Thus seed setting in tetraploid rye is much reduced if the plants are exposed to the pollen of diploid rye, many triploid zygotes being formed, most of which fail to develop into mature seeds. In mixed pollination with $2n$ and n grains, the haploid pollen is more effective in fertilization than the diploid, whether the female parent is tetraploid or diploid. Further experiments are to be carried out on mixed pollination, in view of the practical significance of this problem.

In addition to superiority in sprouting capacity, the tetraploid form is superior to diploid rye as regards baking quality. The tetraploid of the variety Steel has a higher protein content than the diploid parent and gives a 10% larger bread volume. Particularly on account of its good baking quality, the tetraploid of Steel is now being propagated on a large scale; it will be released to farmers in the autumn of 1951 or 1952.

In future work, intercrossing of the best tetraploids will probably play an important role.

1805. Kuzjmin, V. P.
(Breeding winter rye at the Šortanda State Breeding Station).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 6 : 13–21. [Russian].

A new variety of winter rye, Zima [Winter], developed at the Šortanda Research Station, Akmolinsk province, is described. Zima is remarkable for its hardiness, resistance to drought, earliness, 1000 grain weight and baking and milling properties. It was obtained from an adapted but small grained local Kazah population by a method involving mass selection, selective fertilization and training upon different soils followed by hybridization. In the selection importance was attached to (*a*) xeromorphic appearance of the seed during the vernalization phase, (*b*) uniform growth and tillering of the plants in the spring during the light phase, (*c*) short interval between earing and flowering, (*d*) early uniform maturation, (*e*) vigorous root system, (*f*) capacity to form productive tillers, (*g*) large, even grains reaching maturity at the same time, and (*h*) development of many grains per ear.

Mention is made of two rye varieties Gibridnaja 2 [Hybrid 2] at the Karaganda Research Station; and Beljagačskaja at the Semipalatinsk Research Station.
Reference is made to an improvement of grain properties in a local variety by pollinating it with some good rye varieties from Transbaikal, Scandinavia and the Baltic republics.

MAIZE

1806. Ozernyĭ, M.
(My experiments on growing maize).
Kolhoznoe Proizvodstvo (Collective Farming) **1951** : No. **1** : **28–30.** [Russian].

The present writer describes agricultural methods enabling him to obtain remarkably good maize yields in the Dnepropetrovsk province. The account includes a reference to a new large eared variety, Partizanka [Partisan]. It was obtained by natural cross pollination between Sterling and Minnesota 23, training upon good soil and selection.

1807. Sokolov, B. P.
(Increasing the efficacy of breeding work with maize).
Agrobiologija (Agrobiology) **1950** : No. **5** : **36–44.** [Russian].

Breeding work with maize at the Ukrainian Scientific Research Institute of Grain Farming and the institute's base at the Sineljnikovskaja Breeding Research Station is reported. Of the most recently developed intervarietal hybrids, Uspeh [Success], from Brown County x Gruševskaja 380, and Kollektivnyĭ [Collective], from Minnesota 13 x Gruševskaja 380, have been made standards, the former in the Ukrainian steppes and the latter in the Stavropolj territory. Breeding initial varieties for further crosses is in progress with material comprising élites of Dnepropetrovskaja Brown County, Gruševskaja Dnepropetrovskaja, Sterling Dnepropetrovskiĭ, Risovaja 645 [Rice 645] and Gruševskaja 280. These varieties were originally obtained at the Sineljnikovskaja (formerly Dnepropetrovsk) Breeding Research Station.
The family and group selection methods, previously used at the institute to maintain uniformity and productiveness, have been superseded by mass selection. Large scale cultivation of the F_1 hybrids from intervarietal crosses and from crosses between inbreds is regarded as the most efficacious method of breeding for high yield. This applies particularly to the main maize growing districts where selected varieties are cultivated. Mičurinite agrobiology rejects the inbreeding method because it reduces vigour. However, under certain conditions lines with good heritable properties can be obtained as a result of selfing for production of high yielding hybrids.
Many inbred lines productive in crosses, including the following, were bred at the institute.
G–380 was derived from Gruševskaja Dnepropetrovskaja and was multiplied under conditions favourable to free cross pollination. The line is less productive than the initial variety. It was a male component in crosses which produced the hybrids Uspeh and Stepnjak [Steppe].
B–907 was obtained from continued inbreeding of Dnepropetrovskaja and subsequently grown under conditions favourable to cross pollination. The line is 23–30% less productive than the initial variety. It is being used as a female parent in breeding Stepnjak.
G–28 was developed from Gruševskaja Dnepropetrovskaja. It has been multiplied by natural cross pollination on isolated plots. The plants have sturdy single stems, broad leaf blades and thick stubby ears. The line was used as a female component in the cross which gave the hybrid Dneprovskiĭ [Dnepr].
G–22 was bred from Gruševskaja Dnepropetrovskaja and multiplied by free cross pollination. The plants tiller vigorously. Progress was derived from a cross involving this line as a female component.
S–84 was obtained by inbreeding Sterling and subsequently developed by natural cross pollination. The line is mid-late in maturing and shows resistance to wind damage. It was used as a male component in crosses which gave Dneprovskiĭ and Progress.

Mention is made of very early lines which were bred at the institute from the late and mid-early Sterling and Brown County varieties, and of lines, whose origin is not specified, resistant to bunt.
Several unnamed Soviet plant breeding institutes are criticized for delay in production of inbred lines and other institutes for inadequate organization of exchanges of inbred material.
The study of heterosis showed that many F_1 hybrids outyielded the standards by 15–20%, while hybrids from some crosses yielded less than the initial forms or standards. The best results were obtained by crossing material of different botanical groups and by using local standards as one or both components in the crosses.
Comparative trials of hybrids obtained by different methods showed that hybrids resulting from double crosses and top crosses were more productive than intervarietal hybrids. Dneprovskiĭ, from G–28 x 5–84, and Stepnjak, from B 907 x G–380, and Progress, also a double cross, proved most productive in the state trials. The high yield of these hybrids is ascribed to the heterotic effect produced by particular combinations of parent forms, and not necessarily to the fact that the hybrids were obtained from inbred material. It is considered that the extent of heterosis is determined by the differences between the reproductive cells of the parent forms. The differences between the components in the crosses must be greater than for instance between Harjkovskaja 23 [Harjkov 23] and Belaja Zubovidnaja [White Dent] but not as great as between Brown County and Risovaja. It is concluded that heterotic effects can be obtained more readily by top-crossing and double crossing than by intervarietal hybridization.
Investigations on maintenance of heterosis showed that the F_2 always yielded less than the F_1. It was found that the yield decline was less marked in intervarietal hybrids than in hybrids obtained from top-crossing or double crossing. However, the F_2 was, but for a single exception, as productive or more productive than the standard, Brown County. The F_3 and F_4 were found to be as productive as the F_2.

1808. Scossiroli, R.
Per la conoscenza del nanismo del mais. (Investigations on dwarfing of maize).
Ann. Sper. Agrar., Roma **1951 : 5** : 157–77.

Prevalent in northern Italy in 1949, the disease in question is characterized by shortening and thickening of all or some of the internodes of the stem, in some cases associated with complete or partial male sterility, but in other cases with complete sterility of the tassel and ear. The disease has been attributed to a virus.
Observations from various localities in Italy show that dent maizes exhibit a higher percentage of diseased plants than flint varieties, though the reaction of the individual plants of both types of maize differs little. Possibly the flint varieties studied may have had a factor for resistance.

1809. Gorbanov, G.
(For the cultivation of maize, bean and soya bean in the northern districts).
Kolhoznoe Proizvodstvo (Collective Farming) 1950 : No. 6 : p. 42. [Russian].

The crops gave good yields and reached maturity when grown experimentally on a farm in the Molotov province. The maize variety Severnaja [Northern] and the *Phaseolus* bean variety Ščedraja [Generous] were selected for earliness.

1810. Laughnan, J. R.
Further studies on the mutation of A^b in maize.
Genetics **1950 : 35** : p. 674. (Abst.).

More extensive data on mutation of the locus A^b (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 2539) in individuals of the genotype $A^b a$ agree with the interpretation that most of

the A^a mutants, but not necessarily all, arise by crossing-over between units comprising locus A^b, A^a representing a proximal component of A^b. A low rate of mutation to A^a occurs in plants of the consititution A^bDf. Six of the 56 cases of A^a from A^bEt/a *et* plants were non-recombinants for *et*; these may be regarded as either point mutations or double cross over events. The frequency of occurrence of mutants A^a in gametes of A^bB^b plants is similar to that in sib A^ba individuals; the origin of many of the A^a types in the former plants cannot be explained by point mutation. According to the above hypothesis on the structure of locus A^b they are interpreted as cases of unequal exchange.

1811. Everett, H. L.
A proposed relationship between suppressor gene mutants and heterosis.
Genetics 1950 : **35** : p. 663. (Abst.).

Several suppressor mutant genes have been isolated in the course of investigating chlorophyll formation in maize inbreds. These genes overcome, in varying degrees, the effects of a pleiotropic gene causing light endosperm colour and albinism of the plant when in the homozygous recessive condition. The general suggestion is made that the combination of inbred genomes, as in the production of maize hybrids, results in the reestablishment of many alternate pathways of biosynthesis, and thus in a more favourable adaptability of the organism to environmental changes which is expressed phenotypically as hybrid vigour. With inbreeding, blocks of homozygous recessive loci drastically limit the biosynthetic processes and plant vigour is accordingly reduced. The hypothesis is based on the assumption that suppressor gene mutants are common for a majority of gene actions and that such suppressor genes are of importance in fostering the phenotypic expression of maximum adaptability.

1812. Baljura, V.
(Hybrid seed of maize).
Kolhoznoe Proizvodstvo (Collective Farming) 1950 : No. 6 : 25–26. [Russian].

Mention is made of recent instructions on breeding hybrid maize for all the main maize growing regions of the USSR. These contain lists of suitable male and female varieties and descriptions of the breeding methods. Minnesota 13 Extra x Gruševskaja proved a productive hybrid for the Stavropolj territory. Agricultural methods for growing maize hybrids and the technique of artificial pollination are described.

1813. Jenkins, M. T.
Hybrids predicted from the uniform tests sponsored by the Northeastern and North Central Corn Improvement Conferences.
Div. Cereal Crops Dis. Bur. Pl. Indust. Soils, Agric. Engin. Beltsville, Md 1949 : Pp. 56. (Mimeographed).

An index is given of the pedigrees of experimental double hybrids of maize predicted as a result of the uniform tests of single crosses recently sponsored by the North Central and Northeastern Corn Improvement Conferences.

1814. Neal, N. P.
New Wisconsin hybrids produce better ears.
Crops and Soils 1951 : **3** : No. 6 : p. 29.

The maize hybrids W416AA and W685 are being released for commercial seed production in 1951. W416AA, with a 95-day maturity, is similar in general appearance to W416, a hybrid widely used in Wisconsin, but gives slightly higher yields and bears longer and more slender ears; it has good resistance to stalk rotting diseases. W685, with a 120-day maturity, equals the popular hybrid W692 in yield. The ears of W685 have a medium

low, uniform position; this hybrid therefore has a better appearance in the field than W692. Seed of three other new hybrids, W270, W341A and W464A, which were released in 1950, is available in limited quantities for planting in 1951 (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2287).

1815. Bocanegra S., S.
Producción de híbridos y variedades sintéticas de maíz amarillo para la costa central del Perú. (**Production of hybrids and synthetic varieties of yellow maize for the central coast of Peru**).
Bol. Minist. Agric., Lima 1950 : No. 38 : Pp. 5.

Inbreds have been obtained from a number of Peruvian varieties, six lines, derived from the varieties Santa Clara, Uhina Amarillo Cuzco, Lurín Amarillo and Estrella, being of particular interest. Two F_1 hybrids have been produced, LM 1 and 2, both yielding considerably more than the open-pollinated control. The first was derived from intercrossing inbreds 1 (Santa Clara) and 3 (Estrella), the second from 3 x 4 (Uhina Amarillo Cuzco). Work is now in progress on the production of synthetic varieties.

1816. Manoni, R.
Mais ibridi d'importazione americana. Risultati conseguiti nella campagna 1950 in prov. di Lucca. (**Hybrid maizes imported from America. Results obtained in the 1950 season in the Province of Lucca**).
Agricoltura Tosc. 1951 : **6** : 88–90.

Further comparative trials of American hybrid maizes and Italian varieties confirmed the results obtained in 1949 (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 1599). The highest yield, 859 qu. per ha., attained by the American variety U-41, was approximately twice as high as that of the best Italian variety, though some years ago the Italian variety Nostrano dell'Isola exceeded 899 qu. per ha. on some of the better farms.
Details of the performance of Wisconsin 464, Pioneer 340 and U-41 are tabulated.

1817. Fenaroli, L.
Mais ibridi prodotti in Italia. (**Hybrid maizes produced in Italy**).
Ital. Agric. 1951 : **88** : 77–84.

The stage has now been reached in Italian investigations on the value of hybrid maize, when consideration can be given to the question of the official production of commercial seed of hybrid types of proved suitability to certain environments and not replaceable by other varieties.
The present article discusses, with reference to the two American hybrids Insubria 1 and 2 (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 931), the whole question of the best method of nomenclature of hybrid maizes of American or Italian origin. The main part of the paper deals in detail with the origin and characteristics of two new hybrids Insubria 156 (= Iowa 4316 — Italian bred) and 2201 and their performance in trials in various parts of Italy. Both have been produced by the Station for Maize Cultivation, Bergamo, and Insubria 2201 was intended specially to counter the prevailing objections of Italian growers to the dent type and pale yellow grain of the US hybrids, instead of the vitreous and orange yellow kernels preferred in Italy.
Insubria 2201 and Amadrie, bred in Holland by the American maize firm Apeldoorn, are thought to be the only hybrid maizes bred entirely in Europe, i.e. from indigenous parent lines.

1818. Salamov, A. B.
(**New data on the problem of fertilization in maize**).
Agrobiologija (Agrobiology) 1950 : No. 4 : 110–18. [Russian].

In Mičurinite experiments with maize, which included the study of selective and supplementary fertilization at the North Osetian Breeding Research Station, several hybrids

derived from Braziljskaja Sinjaja Krahmaljnaja [Brazilian Blue Starchy] proved very productive. The cross between G–23 and the Brazilian variety, for instance, outyielded the best inbred lines. The use of maizes from world collections in breeding for high yield is advocated.

The results of studies of the problems associated with selective fertilization are reported. Instances of polyspermy were most remarkable in the progenies of the following crosses with pollen mixtures: (1) Osetinskaja Belaja Zubovidnaja [Osetian White Dent] x Minnesota 13 Extra + Risovaja Belaja [White Rice], (2) Osetinskaja Belaja Zubovidnaja x Braziljskaja Sinjaja Krahmaljnaja + Minnesota 13 Extra, (3) as in (2) but the pollen mixture including the pollen of Belaja Kremnistaja [White Flint], (4) Sterling x Sterling + Gruševka 28 [Pear 28] + Braziljskaja Sinjaja Krahmaljnaja, and (5) Saharnaja Želtaja [Sweet Yellow] x Saharnaja Želtaja + Risovaja Belaja. Evidence was obtained that the time when the female variety is cross-pollinated with mixed pollen has some effect upon its selective capacity and yield. Late cross pollination results in more yellow seed and less white seed of the female parent type and in smaller 1000 kernel weights of the seed of all kinds except yellow seed. The phenomena of polyspermy were more frequent when pollination was delayed.

In hybrids from multiparental crosses the characters of some male varieties were not always apparent. This was most frequently the case with hybrids from crosses involving Risovaja Belaja as the female parent. In the present experiments this variety showed remarkable preference for its own pollen. Most other varieties also selected the pollen of Risovaja Belaja from the pollen mixtures. Risovaja Belaja often gave a white seeded F_1 when crossed with male varieties having a different type and colour of kernel. Reference is made to a white grained flint-dent hybrid, which was obtained from a cross between a white flint and a yellow dent maize.

Changes in the selective capacity of a variety depending on the time of application of the self pollen and foreign pollen to the stigmas were studied. This is illustrated by examples of crosses Osetinskaja Belaja Zubovidnaja x self pollen + Želtaja Zubovidnaja 3 [Yellow Dent 3]. The female variety had 80% selective capacity for self pollen when the mixed pollen was applied simultaneously. The application of Yellow Dent 3 pollen after an interval not exceeding one hour, altered the selective capacity of the female variety so that half the florets were fertilized by Yellow Dent 3 pollen. The percentage of florets fertilized by Yellow Dent 3, on the other hand, became lower when the interval between the application of the self and foreign pollen was increased to two hours. The reverse process of applying self pollen two hours after the foreign pollen had the opposite effect of increasing the selective capacity for self pollen. The selective capacity for self pollen became low when the interval between the application of the foreign and self pollen was increased to 3 hours.

Experiments showed that supplementary fertilization increases the yielding capacity of maize varieties and maize hybrids.

1819. Duncan, R. E. and
Ross, J. G.
The nucleus in differentiation and development. III. Nuclei of maize endosperm.
J. Hered. 1950 : **41** : 259–68.

Changes in nuclear size and activity were analysed in the developing endosperm of a maize line with two heterochromatic knobs per chromosome set. Observations were made at 3, 6, 10, 14, 20 and 25 days after sib or self pollination. The diameters of 100 energic nuclei in 100 adjoining cells in each of the localized areas chosen for study were measured, to estimate the average volume and surface of the nuclei in each area. Nuclei in the adgerminal layer of endosperm cells lying between the embryo and the adjacent enveloping tissues were generally smaller than those in the outermost layer of endosperm cells in the abgerminal position. In both these areas a reduction in nuclear size during the period 10 to 14 days after pollination was noted; in neither area did the nuclei show any subsequent increase in size. The nuclei in the central area of the endosperm, however, became up to

1000 times their original volume in the 24 days following pollination. The chief phase of this nuclear growth corresponded with that of the endosperm as a whole and with the inception and development of starch storage. The nuclear growth was a process of endomitosis, in which the number of strands per chromosome and the breadth and length of the individual strands increased. The number of knobs and nucleolar organizers per nucleus did not alter, indicating that the chromosome number per nucleus remained constant. The increase in the amount of nuclear surface and in the number of chromonemata per chromosome is discussed in relation to the physiological specialization of the endosperm cells.

1820. Suto, T.
(Abnormal meiosis in a line of maize).
Jap. J. Genet. 1942 : **18** : 55–56. [Japanese].

A genetically determined instance of aberrant meiosis is reported for a line of maize. The aberrations include the formation of large, uninucleate or multinucleate cells, or even plasmodia, that fail to develop further; spindle derangement sometimes resulting in restitution nuclei; and asynapsis leading to univalents at metaphase and laggards at telophase. Chromosome clumping was also observed. As a result of these abnormalities fertility was considerably reduced.

1821. Gibson, P. B.,
Brink, R. A. and
Stahmann, M. A.
The mutagenic action of mustard gas on *Zea Mays*.
J. Hered. 1950 : **41** : 232–38.

An apparatus is described by means of which pollen may be treated with mustard gas vapour in accurately graded doses. Chromosomal abnormalities resulting in partial pollen sterility in the F_1 plants were induced with a high frequency in maize pollen subjected to treatment with the mustard gas methyl-bis (β-chloroethyl) amine. Most of the aberrations appeared to consist of deficiencies; few, if any, reciprocal translocations occurred. A linear relationship was obtained between dosage of mustard gas and frequency of partially sterile F_1 plants. The incidence of detectable point mutations was found to be low in comparison with the chromosomal aberrations producing sterility. Although losses of the effects of the dominant genes *Su*, *Wx*, *Pr* and *R* characterizing the entire kernel were found in 12% of the F_1 endosperms subsequent to moderately severe mustard gas treatments of pollen, no evidence of increases in losses of the effects of these genes was found in the associated embryos. This result suggests that predispositions to certain genetic changes were induced rather than the changes themselves; the primary endosperm cell but not the egg provided conditions favourable for the realization of these potential changes. Losses of different dominant marker characters affecting only a portion of the endosperm were 1·4 to 4·0 times as frequent as those involving the whole tissue.

1822. Burnham, C. R.
Crossing over in an inversion heterozygote.
Genetics 1950 : **35** : p. 659. (Abst.).

A maize stock homozygous for translocation 5–6c and heterozygous for the pericentric inversion 5a has a chromosome pair heterozygous for the inversion and attached to the nucleolus. Translocation 5–6c consists of ·89 of the long arm of chromosome 5 adjacent to the centromere in the short arm of 6; pericentric inversion 5a comprises ·67 of the long arm of 5 near the centromere in the short arm of this chromosome. Spore quartets, with two spores having diffuse nucleolar material, are expected only as the result of 4-strand double cross overs within the inversion. Out of 1744 quartets, only 0·9% were of this type, indicating a low frequency of double crossing over. The following data were obtained on crossing over in plants heterozygous for both T5–6c and 5a. In plants of type 1, i.e.

with the inversion in the normal chromosome 5 without the translocation, 45% of the cross over type of quartets occurred, whereas in plants heterozygous for T5–6c, but not carrying the inversion, 63% of such quartets were produced. The reduction appears to be largely due to a decrease in the frequency of multiple cross overs within the inversion. In plants of type 2, i.e. with the inversion in the translocated chromosome 5, 12% of the cross over type of quartets were obtained. Only cross overs between the inverted centromere and the translocation point of 5 were detectable. The latter percentage is comparable with the 11% observed in plants heterozygous for T5–6c but homozygous for the inversion; and it indicates no reduction in crossing over in this region adjacent to the heterozygous inversion.

1823. Ibrahim, M. A. E.
Cytogenetic studies of tertiary trisomics in maize.
Genetics 1950 : **35** : 671–72. (Abst.).

Tertiary trisomics of two types were identified in the progeny of plants heterozygous for translocation T5–6a, involving breaks at approximately ·12 of the long arm of chromosome 6; or in later generations from the primary trisomic for chromosome 6 crossed with T5–6a plants. Both types showed a chain of five chromosomes at diakinesis. In one type, (6^5a), the extra chromosome is 6, with the translocated piece of its long arm replaced by the greater portion of the long arm of 5; in the other type, (5^6a), the extra chromosome is 5 with the greater part of its long arm replaced by the translocated portion of 6. In the tertiary trisomic (6^5a) there are three chromosomes attached to the nucleolus at meiosis; in (5^6a) there are only two. The frequency of double nucleoli in the microspores was 7·03% in (6^5a) and 0·17% in (5^6a). Stock (6^5a) exhibited trisomic ratios for *pr* and *y* whereas (6^5a) yielded only disomic ratios, indicating that *pr* is located in the translocated portion of 5 and that *y* is not situated in the translocated piece of chromosome 6.

1824. Dungan, G. H. and
Gausman, H. W.
Clipping corn plants to delay their development.
Agron. J. 1951 : **43** : 90–93.

Synchronization of reproductive development of maize, for purposes of cross pollination, has been achieved at the Illinois Agricultural Experiment Station in double and single cross hybrids and in inbreds by clipping plants of the forward strain during the early growth stages; from 3 to 6 days' delay, accompanied by a significant decline in yield, can be obtained without difficulty in double hybrids, but single cross individuals and inbreds show differential responses to clipping.

1825. Babadžanjan, G. A.
(The difference between vitality and inheritance in plants).
Agrobiologija (Agrobiology) 1950 : No. 5 : 1–12. [Russian].

Experiments with maize at the Institute of Breeding and Genetics of the Academy of Sciences of the Armenian SSR support the Mičurinite thesis that inheritance and vigour are two separate properties of a plant organism.
The evidence was obtained in pollination experiments with three white-grained, one blue-grained and four yellow-grained maize varieties. The methods consisted of (*a*) free pollination of white-grained varieties with white-grained, yellow-grained and a blue-grained variety, (*b*) self pollination of white-grained varieties, (*c*) artificial hybridization, and (*d*) supplementary fertilization with pollen mixtures containing 1/5 foreign pollen and 4/5 self pollen. In later experiments a white-grained variety, 10, was cross-pollinated with mixed pollen containing instead of self pollen the pollen of other individuals of the same variety. The results are tabulated and discussed.
The evidence leads to the conclusion that in pollen mixtures containing self pollen or pollen of individuals of the same variety the foreign pollen acts as a mentor. As a result, material is obtained which shows constant inheritance and increased vigour.

1826. Schwartz, D.
The analysis of a case of cross-sterility in maize.
Proc. Nat. Acad. Sci., Wash. 1950 : **36** : 719–24.

The factor Ga_1 on chromosome 4, already studied by several investigators, is comparable with the genes for self sterility found in *Nicotiana, Oenothera, Trifolium* and other cross-fertilized plants, in that interaction occurs between the stylar tissue and male gametophyte. When the female parent is homozygous for the recessive ga_1, pollen carrying ga_1 can compete successfully against pollen with Ga_1 and fertilize half the ovules; if the female parent is homozygous or heterozygous for Ga_1, ga_1 pollen achieves fertilization in only 0 to 4% of the ovules; if only ga_1 pollen is used in the cross full seed set is obtained regardless of the genotype of the female parent. The present paper gives data reporting occurrence of a third allele at this locus, designated Ga_1^5. Pollen carrying ga_1 completely fails to function on styles homozygous for Ga_1^5, even in the absence of competing pollen. Both the linkage relationship of Ga_1^5 with *Su* and the interaction of Ga_1^5 with Ga_1 provide evidence that the new factor is an allele of Ga_1.
The manner in which selective fertilization is accomplished has not been established; the failure of ga_1 pollen to fertilize $Ga_1^5Ga_1^5$ plants may be independent of stylar interaction and may involve some abnormal reaction within the ovule, such as inability of the pollen tube to penetrate the embryo sac.

1827. Teas, H. J. and
Anderson, E. G.
Blue fluorescent, a new mutant in maize.
Genetics 1950 : **35** : 696–97. (Abst.).

Ultraviolet light examination of maize seedlings derived from material subjected to atomic bomb radiation in the Bikini test revealed a family segregating for the recessive character of bright blue fluorescence in place of the usual red colour; by daylight the mutant seedlings were indistinguishable from normal ones. Anthers of both heterozygous and homozygous plants were blue fluorescent. Seedlings develop chlorophyll in approximately normal amounts but fail to show the characteristic red fluorescence because of the masking effect of the blue fluorescent material. The latter material has been identified as anthranilic acid.

1828. Blanco, J. L.
Pollen size and quantitative inheritance in maize.
Genetics 1950 : **35** : 654–55. (Abst.).

Analysis of pollen size in hybrids, varieties and inbreds indicated that the pollen of inbreds had a smaller range in size but a larger mean size than the pollen of hybrids and varieties. The following results were secured from an analysis of pollen size in two stocks, each with one ring of 8 chromosomes (translocation 1–5–7–6), and of their corresponding parents. The normal parent stock and parents homozygous for the translocation showed a unimodal distribution for pollen size. The occurrence of normal pollen in F_1 plants with the 8-chromosome ring indicated a bimodal distribution in certain plants, as expected from the segregation into two classes representing the translocation and normal complements. No significant influence of environment on pollen size has been found. It is hoped that analysis of pollen size and behaviour may be a method of analysing inheritance of quantitative characters or predicting the behaviour of lines; experiments are being carried out to study pollen size in relation to combining ability and the possibility of selective action on pollen by distinctive pollen behaviour.

1829. Singleton, W. R.
Corn grass, a dominant monogenic spontaneous mutant, and its possible significance as an ancestral type of corn.
Genetics 1950 : **35** : 691–92. (Abst.).

Corn grass, which arose as a spontaneous mutant of maize, depends upon a single dominant gene affecting the gross morphology of the plant; good monogenic ratios are obtained in

selfed and back-crossed progenies. Under field conditions corn grass tillers profusely, making a clump of up to 100 tillers with very narrow leaves and no tassels. The very small "ears" each usually bear 0 to 20 seeds. The plant can be asexually reproduced by dividing the clump. Attempts to induce reverse somatic mutations by X-irradiation, treatment with P^{32} and growing under continuous γ radiation from Co^{60} have so far failed. Tassels are not normally produced in the field; in the greenhouse, under conditions of reduced illumination during the short autumn days, corn grass plants produce few tillers, a more upright growth and tassels with good pollen. The seeds are usually developed in podded ears; extreme variability in this feature, however, occurs among the ears of a single plant. It is possible that the original ancestor of maize may have been a plant like corn grass and that maize arose as a single gene mutation.

1830. Andrés, J. M.
Granos semivestidos, restos de un carácter ancestral del maíz. **(Semitunicate grains, remnants of an ancestral character of maize).**
Rev. Argent. Agron. **1950 : 17 : 252–56.**

Semitunicate maize is determined by a single recessive gene together with multiple modifying factors. The author suggests that semitunicate maize is the form from which modern maize has descended, the tunicate gene *Tu* not being a primitive character.

1831. Cameron, J. W.,
Newton, A. and
Teas, H. J.
Carbohydrate, auxin, niacin, and tryptophane in developing kernels of sugary and starchy maize.
Genetics **1950 : 35 : 659–60.** (Abst.).

Two series of maize grains were chemically analysed: (1) grains from ears in each of which both the gene su_1 for sugary endosperm and its normal allele Su_1 were segregating; and (2) Su_1 grains from the standard line KYS and su_1 grains from an su_1 conversion of KYS. On the basis of the amount of substance per kernel, sucrose was higher in su_1 than Su_1 seeds from 16 days after pollination; water soluble polysaccharides became increasingly higher in Su_1 after 16 days; reducing sugars showed little difference. Niacin increased in both genotypes from 12 to 28 days after pollination and was consistently higher in Su_1 grains. Total auxin increased rapidly; from 16 to 28 days it was similar in amount in Su_1 and su_1 seeds. In series (2) the tryptophane content was similar in both genotypes during a period of 32 days; in series (1) su_1 endosperms had a consistently higher content after 18 days. Tryptophane content varied widely, however, among homozygous Su_1 lines with theoretically similar genetic backgrounds. The simultaneously higher content of sucrose, water soluble polysaccharides and niacin in su_1 grains, from about 16 days after pollination, suggests a functional relationship between these substances.

1832. Randolph, L. F. and
Hernandez-Xolocotzi, E.
Cytotaxonomic diversity of *Tripsacum* in Mexico.
Genetics **1950 : 35 : p. 686.** (Abst.).

Recent explorations in Mexico and adjacent regions of Guatemala have led to the conculsion that the present centre of diversity of *Tripsacum* is in south western Mexico, a region where *Euchlaena* and many types of primitive maize also occur. Cytotaxonomic field studies in certain areas have confirmed the prevalence of tetraploid *Tripsacum* with multivalent chromosomal associations previously reported by other investigators. Two new diploid species, *T. Maizar* and *T. zopilotense*, have been discovered in Guerrero. The former is more maize-like than the other species of *Tripsacum* so far described; the latter is very grass-like in its growth habit. Evidence that the present day tetraploids of Mexico and Guatemala are allopolyploids of these, or closely related species, was provided by the following: the successful cross between *T. Maizar* and *T. zopilotense*; the observed

prevalence in geographically isolated areas of numerous tetraploid populations having distinctive combinations of the contrasting characters of the diploid species; and experimental proof of the cross fertility of the tetraploids. These observations are interpreted as strong support of the view that maize originated in Mexico.

1833. Scossiroli, R.
Contributo alla conoscenza del mais (*Zea Mays*). Descrizione agronomica. [**A contribution to the study of maize (*Z. Mays*). Agronomic description**].
Suppl. Ann. Sper. Agrar., Roma 1951 : **5** : XXIII–XLI.

As a supplement to the writer's paper on taxonomic characters of Italian maizes (cf. Abst. 308), the present article elaborates a further descriptive list of 64 characteristics subject to variation owing to cultural conditions, heterosis or hereditary factors. Ranges of variation are also set out for characteristics pertaining to the root system, stem, leaves, male and female inflorescences and their various parts, resistance to diseases, and potential fertility. Chemical features of stem, ear and kernels of the particular variety, its regional distribution and economic use are also included in the descriptive schedule.

1834.
Experiencias con maíces híbridos americanos. (**Experiments with American hybrid maize**).
Bol. Inform. Minist. Agric., Madrid 1950 : **3** : No. **23** : 41–43.

Variety trials of introduced American maize hybrids are reported from Cornellana, Abrera, Durango and Ciudad Real. A number of American hybrids yielded better and were more resistant to smut than local varieties.

1835. Fenaroli, L.
Le introduzioni di piante e semi eseguite dalla Stazione Sperimentale di Maiscoltura nel 1949 (nn. 49001–49317). [**The introductions of plants and seeds by the Experimental Station for Maize Cultivation in 1949 (Nos 49001-49317)**].
Suppl. Ann. Sper. Agrar., Roma 1951 : **5** : I–XXII.

The list includes large numbers of hybrid and other maizes from America and other countries, and also varieties of *Solanum tuberosum, Cucumis Melo, Citrullus vulgaris, Sorghum vulgare, Cucurbita Pepo* and *Rubus*.
Ears of 34 types of hybrid maize introduced by the Station are illustrated.

1836. Mjagkov, N. V.
(**The cultivation of maize at Pučež**).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 7 : 76–77. [Russian].

The maize varieties adapted to cultivation in the Ivanovskaja province include Pionerka Severa [Pioneer of the North], Skorospelyĭ Gibrid 6 and 7 [Early Maturing Hybrid 6 and 7] and a late flint variety of unknown origin cultivated by a gardener at Pučež. It is a tall single stem variety producing two ears high above the ground. The dried cobs each weigh 300 grm.

1837. Becker, W. R.
Maisrassen- en -cultuuronderzoek. (**Maize varieties and cultivation**).
Versl. Cent. Inst. Landbouwkundig Onderzoek, 's-Gravenhage 1949 : 89–93.

Apparently early ripening alone is not sufficient to ensure success of a maize variety in Holland. Some degree of cold resistance is equally important, so that seedlings will continue to grow despite coldness of the soil during cold weather in May and June.

1838. George, L. V.
Dixie 18, hybrid corn, stands up with best.
Sth. Seedsman **1951** : **14** : No. **3** : 14, 67.

The variety Dixie 18 (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 1572) is to be released in Louisiana, where recent tests have shown its exceptional resistance to lodging and its ability to give high yields in many localities.

1839. McKeen, W. E.
Preliminary studies of root and basal stalkrot of corn in Ontario.
Proc. Canad. Phytopath. Soc. **17** Session **1950** : No. **18** : p. **12.**

Root degeneration of maize may be initiated by *Pythium* spp., *Gibberella* spp. and *Rhizoctonia Solani*. Seedling reaction to the pathogens is indicative of reaction at the later stages of plant development.

1840. Michaelson, M. E.
A laboratory method for testing reaction of corn to stalk-rotting organisms.
Phytopathology **1951** : **41** : p. 26. (Abst.).

Marked disparity in the susceptibility of hybrids and inbred lines of maize to races of *Diplodia Zeae* and *Gibberella Zeae* was evident from the use of an inoculation method devised to provide subsequent uniform environmental conditions. Three inch sections of maize internodes taken from young plants were used.

1841. Koehler, B.
Husk coverage and ear declination in relation to corn ear rots.
Phytopathology **1951** : **41** : p. 22. (Abst.).

From observations of open-pollinated maize the following classes were selected based on ear characters: (1) ear declined lower than horizontal, (2) ear tip resting on the ground, (3) ear erect and (4) ear flat on the ground; the average percentages of rot-damaged kernels were respectively 1·4, 2·2, 2·9 and 6·9. Infection by *Diplodia Zeae*, *Fusarium moniliforme* and *Gibberella Zeae* was equal in all classes but *Nigrospora Oryzae* was especially prevalent in lodged ears; in all classes, ears well covered by husks were less infected than those with exposed tips. Rot was increased in all hybrids by exposing the ear tips at ten-day intervals by pulling back the husks; although none were immune rot damage was least in those individuals with completely husked ears which hang downwards.

1842. Taylor, G. S.,
Semeniuk, G. and
Melhus, I. E.
Guatemalan corn as a source of resistance to *Helminthosporium turcicum* in maize.
Phytopathology **1951** : **41** : 34–35. (Abst.).

In attempts to obtain maize varieties with resistance to *H. turcicum*, several US inbred lines were crossed with resistant open-pollinated Guatemalan plants. Seedlings and adult plants of the F_1 generation were resistant. Segregation observed in the advanced generations and in back crosses with the susceptible US parents indicated the heterozygous nature of resistance in the open-pollinated Guatemalan forms.

1843.
Borer-tolerant hybrids are announced by Iowa crops workers.
Crops and Soils **1951** : **3** : No. **5** : p. **26.**

Six new maize hybrids tolerant of borer attack will be available to farmers in Iowa in 1952, comprising Iowa 4376, 4470 and 4537 for the northern and central regions, and Iowa 4531, 4525 and 4527 for the south.

1844.

Corn hybrids and varieties in Mississippi, 1948 tests.
Bull. Miss. Agric. Exp. Sta. 1948 : No. 460 : Pp. 13.

Corn hybrids and varieties in Mississippi, 1949 tests.
Ibid. 1949 : No. 468 : Pp. 15.

The results of extensive tests of commercial maize hybrids in comparison with open-pollinated varieties and new hybrids, carried out in Mississippi during 1948 and 1949, are summarized. The yellow commercial hybrid Dixie 18 (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 1572) and the white commercial hybrids Dixie 11 and Dixie 17 are first on the list of recommendations for south, central and north Mississippi respectively.

1845. Pfeiffer, R.
Ergebnisse der Admonter Maisversuche 1950. (**Results of the Admont maize trials 1950**).
VersErgebn. Bundesanst. alp. Landw. Admont 1950 : No. 6 : Pp. 28.

These trials are a continuation of the hybrid maize trials begun in 1949. The results of performance tests with American hybrids and Austrian bred varieties in a wet Alpine climate in Austria are compared with the results of the 1949 trials. An attempt was made by yield analysis to discover the component characters of yield in some of the more notable varieties of green maize; in the case of silo maize, calculations were made of the correlations between yield and its individual components. The variety Wisconsin 692 showed the highest yield of silo maize and in the green maize trials this variety was one of the highest yielding.

BARLEY

1846. Hörberg, Y.
Weibulls original Hertakorn. (**Weibull's Herta barley**).
Agri Hortique Genetica, Landskrona 1950 : **8** : 65–73.

A detailed account is given of this barley and its origin (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 1791 and Vol. XXI, Abst. 1847).

1847. Hörberg, Y.
Weibulls original Hertakorn. (**Weibull's Herta barley**).
Weibulls Ill. Årsb. 1950 : **45** : 19–20.

The yield and characteristics of the barley Herta already mentioned in Abst. 1846 are described.

1848. Hörberg, Y.
Weibulls original Rikakorn. (**Weibull's Rika barley**).
Weibulls Årsb. 1950 : 7–8.

This barley (cf. Abst. 872), which is to be released in spring 1951, is a sister variety of Herta which it equals in mildew resistance.

1849. Middleton, G. K. and
Hebert, T. T.
Colonial barley.
Spec. Circ. N.C. Agric. Exp. Sta. 1950 : No. 9 : Pp. 8.

A detailed account is given of the new barley variety Colonial, developed at the North Carolina Agricultural Experiment Station (cf. Abst. 1022).

1850. McVickar, G. E.
Bonneville, new barley developed at Utah, best for irrigated soils.
Crops and Soils 1951 : **3** : No. 6 : p. 32.

The spring barley Bonneville, developed from the cross (Coast x Lion) x Winter Club, has outyielded Velvon by 20% in trials in Utah. It is four to six days later in maturity than Trebi and Velvon. The new variety is recommended for fertile, irrigated soils.

1851. Woodward, R. W.
Bonneville—a new spring barley ready for release.
Fm Home Sci. Utah 1950 : **11** : 5, 8.

Bonneville, a new spring barley, has been produced by the Utah Agricultural Experiment Station, from the cross Colorado 3063 x Winter Club. It has outyielded every barley previously tested at the station and is particularly adapted to fertile, irrigated regions with a long growing season. The erect, stiff straw bears club heads with smooth awns.

1852. Haan, H. de.
Gerstveredeling in Duitsland. (**Barley breeding in Germany**).
15de Nacobrouw Jb. 1951 : 50–53.

In this brief review of barley improvement in Germany mention is made of the need for rust and mildew resistant barleys. The contribution which the Weihenstephan Institute has made to this problem includes the production of breeding material from which the following mildew resistant barleys were bred: Vogel's mildew resistant Weihenstephan (1945), Erika (1947), Firlbeck's II (1948), Streng's Franken III (1948) and Isdania (1949). The German variety list now includes also the mildew resistant winter barley Streng's Domina.

1853.
Idaho Club, new winter barley for farmers, maltsters of Northwest.
Crops and Soils 1951 : **3** : No. 6 : p. 28.

The new six-rowed barley Idaho Club is characterized by high yielding ability, good malting quality, heavy stiff straw and a rough beard. In northern Idaho it has produced 40 to 60 bushels per acre in yield trials.

1854. Favret, E. A.
Mutaciones inducidas con formaldehida en cebada. (**Barley mutations induced with formaldehyde**).
Rev. Argent. Agron. 1950 : **17** : 260–61.

Albinos and forms susceptible to *Erysiphe graminis* var. *Hordei* have been obtained by soaking grains of the mildew resistant variety Engledow India in 40% formalin for 1–5 minutes.

1855. Smith, L.,
Sieburth, L. R. and
Norby, B.
The relation of oxygen concentration in barley seeds to the biological effects of X-ray.
Genetics 1950 : **35** : p. 692. (Abst.).

Prior to X-ray treatment, barley seeds were soaked for 24 hours in (1) cooled, boiled distilled water; (2) untreated distilled water; and (3) distilled water to which oxygen was added. At the end of the pretreatments the seeds were X-irradiated under identical conditions in air. Injury was measured in terms of survival and seedling height. For the

control and the above three treatments the relative survival values were respectively 1·9, 1·6, 1·3 and 1·0 and the relative heights 3·4, 2·2, 2·0 and 1·0. Cytogenetical data are being obtained to supplement these observations on injury.

1856. Wilten, W.
Verslag van een studiereis naar Engeland in 1949. (**Report of a study trip to England in 1949**).
14de Nacobrouw Jb. 1950 : 67–74.

The barley varieties grown are Spratt and Plumage Archer, late ripening with very weak straw. The Guinness Barley Research Station at Warminster maintains and studies a museum of varieties; breeds, selects and investigates new varieties; multiplies promising varieties; and carries out manuring and weeding trials. Desiderata for spring barleys are: good tillering; a good irrigation coefficient; good brewing and malting quality; short stiff straw; greater earliness than Spratt or Plumage Archer; and sufficient winter hardiness. The Plant Breeding Institute at Cambridge also has an extensive collection of varieties. The refusal of the brewers to accept Kenia has enforced the breeding of a Kenia with Spratt Archer grain. Efforts to breed a winter hardy spring barley are realized in Pioneer and B1. Prefect is a six-rowed winter hardy barley with short straw but inferior yield. Earl is Hunter's effort to get an earlier variety than Spratt Archer. It succeeds by 7–10 days, but is not very stiff-strawed.

1857. Haan, H. de
Gerstveredeling in Engeland en Zuid-Ierland. (**Barley breeding in England and Southern Ireland**).
14de Nacobrouw Jb. 1950 : 42–54.

An account is given of the pioneer work of Hunter and Beaven.

1858. Sergeev, V. Z.
(**For a change in breeding and seed growing methods with local barleys**).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 7 : 45–48. [Russian].

Breeding work with spring barleys in the Rostov province is criticized. The orthodox breeding methods for uniformity, rather than for high yield and resistance to diseases, and introductions into the province of cultivated varieties, at the expense of the available local varieties possessing good economic properties, are the main objections.
It is pointed out that some local forms of multirowed barley are more productive than the breeders' varieties Pallidum 43 and Trebi, while some two-rowed barleys yield only 1–2 c. per ha. less than the new standard Kubanec [Kubanj Dweller], which is susceptible to drought and has a drooping ear. The local barleys outyield Kubanec in arid seasons and are more suitable for combine harvesting. Other promising biological properties of the local barleys include resistance to frost, loose smut and rusts, and tall straw and low chaff percentage and many productive spikelets per ear.
Breeding work with the local barleys is advocated.

1859. Oort, A. J. P.
De vatbaarheid van zomergerst voor stuifbrand. (**The susceptibility of spring barleys to loose smut**).
14de Nacobrouw Jb. 1950 : 63–66.

Ears are artificially infected and grain therefrom sown at 5 to 6 cm. intervals. This method gives 90–100% infection and, with wheat, results conforming to practical experience. This was not the case with barley, where all varieties appeared to be equally susceptible. The degree of opening of the flower is important in determining resistance. A new method was therefore employed using alternate pairs of rows of varieties to be tested and heavily infected Kenia and Lenta. Early flowering varieties may have escaped infection. In

general, varieties flowering at the same time as Kenia and Lenta were about equally infected, except Hylkema which was more resistant and Mansholt's 2-row more susceptible. Of the early flowering varieties, Herta was heavily attacked, Saxonia and Agio slightly less than Kenia, Haisa definitely less and Nova practically uninfected.

1860. Tapke, V. F.
New physiologic races of *Ustilago nigra* from the United States and Israel.
Phytopathology 1951 : **41** : 139–41.

The reactions of eight differential varieties of spring barley to 13 physiological races of *U. nigra* are reported; nine of the races were from the United States and four from collections in Israel. Two of the former were new races and were designated US races 8 and 9. The collections from Israel comprised 6 distinct races; some collections were similar to either US race 4 or US race 6; the remainder represented four new races, designated races 10 to 13. These four new races infected Pannier, a variety which has so far remained free from infection with collections of *U. nigra* in the United States. Race 13 produced smut in all of the eight differential varieties.

1861. Wilten, W.
De veldproeven in 1949. (**Field trials in 1949**).
14de Nacobrouw Jb. 1950 : 88–98.

Thirteen out of nineteen barley varieties exceeded Kenia in yield, but most were not better than Balder. Exceptions were Herta, Weibull 4994 and Haisa Neu, which give 9% more than Balder, ripen distinctly earlier, and have longer straw. Of these only Haisa Neu promises well for brewing quality. The international trials comprised Aurore, Balder, Kenia, Carlsberg and Herta. Only the last beat Balder. Analyses of grain from different districts are given as are also results of nitrogen manuring trials.

1862. Wilten, W.
Opbrengsten, rassenstatistiek en raseigenschappen van brouwgerst.
(**Yields, statistics and characteristics of malting barley varieties**).
14de Nacobrouw Jb. 1950 : 99–109.

Yield figures for varieties on different soils are reported for 1949 and results of Kenia and Balder in the same trials for 1946/1949 are summarized also for soils. Percentages of the barley acreages for the years 1933 to 1944 planted with different varieties are summarized and reported by districts. There is also a comparative table of characteristics of Kenia, Agio, Balder, Mansholts 2-row, and Saxonia.

1863. Wilten, W.
Opbrengsten, rassenstatistiek en raseigenschappen van brouwgerst.
(**Yields, statistics and characteristics of malting barley varieties**).
15de Nacobrouw Jb. 1951 : 75–85.

Yields of seed and straw for about 12 barleys tested in Holland and the area under the different varieties are discussed from tabular data. There is also a table setting out the varietal characters and scores in resistance of five spring barleys, including Kenia, Agio C.B. and Balder, to various diseases.

MILLETS AND SORGHUM

1864. Govande, G. K.
Improved varieties of pulses and lesser millets for Gujerat.
Indian Fmg 1950 : **11** : 194–96.

Improved strains of moth (*Phaseolus aconitifolius*), guar (*Cyamopsis psoralioides*), kodra (*Paspalum scrobiculatum*) and bavto (*Eleusine coracana*), developed from local material in the former Baroda state, are described.

1865. Takahashi, N.
(Genetical studies with *Setaria italica*).
Jap. J. Genet. **1942 : 18** : 150–51. [Japanese].

The genes controlling the following characters have been determined: (1) colourless or grey pericarp, controlled by genes *N* and *G*; (2) yellow or white endosperm, genes Y_1 and Y_2; (3) glutinous or non-glutinous endosperm, gene *M*; (4) ear colour, the three complementary genes *B*, *I* and *K*; (5) leaf sheath colour, the three complementary genes *C*, *R* and *H*; (6) spherical or ellipsoidal grain, the gene pair *E e*; (7) albino seedling, the three genes A_1, A_2 or A_3; and (8) fertile or sterile ears, the gene pair *S s*.

1866. Rostovceva, Z. P.
(The problem of spikelet structure in millet).
Agrobiologija (Agrobiology) 1950 : No. 4 : 155–56. [Russian].

The effect of external conditions on panicle development in millet was studied at the Moscow State University. The environment was varied in the experiments at Zvenigorod by sowing Dolinskoe 86 seed at five day intervals during the period between 6 May and 6 September.
Abnormal dates of planting had the effect of breaking down the conservative inheritance in millet for development of spikelets with single florets. The anomalies observed included spikelets with branching rachillae which bore abnormal florets.

1867. Gildenhuys, P. J.
Fertility studies in *Setaria sphacelata* (Schum) Stapf and Hubbard.
Sci. Bull. Dep. Agric. S. Afr. 1950 : No. 314 : Pp. 45.

Two new methods of estimating the fertility of several morphologically distinct ecotypes of *S. sphacelata* are described, with data from statistical analyses. The results of fertility tests show that high open and self fertility is accompanied by a stoloniferous growth habit, and low self fertility is generally found in vigorous single-tufted ecotypes. It is concluded that this species is normally cross-pollinated; the small amount of segregation in the progeny of the highly self fertile type indicates the occurrence of a certain degree of natural self pollination. Different methods of breeding and their application to improving seed setting in this species are discussed.

1868. Marchal, A.
Les pénicillaires cultivés au Niger. **(The forms of *Penicillaria* cultivated in the Niger territory).**
Agron. Trop. **1950 : 5** : 582–92.

This paper deals largely with the description and classification of cultivated forms of *Penicillaria* in the Niger territory. The writer proposes to establish three main groups, based primarily on panicle characters, and comprising 12 principal types, which are designated by their native names.
Some information is also given on reproduction, vegetative anomalies, the ecology and cultivation of forms of *Penicillaria* in the region, pests, and the prospects of improving the crop by methods of selection.

1869.
Report of the Sorghum Mission to Certain British African Territories.
Publ. Colon. Adv. Counc. Agric. Anim. Health For., London 1951 : No. 2 : Pp. 105.

The report is presented of the mission made to the United States and British East and West Africa in 1949 with the purpose of gaining information as a basis of recommendations for increasing sorghum production in British African territories, for local consumption and also

if possible for export to the United Kingdom for livestock feed. It is considered that sorghum breeding programmes should be initiated or intensified in the different territories, and coordinated by a central office. The fully mechanized production of sorghum will depend upon the availability of suitable dwarf types; where such varieties do not exist locally they will either have to be imported or developed by plant breeders; the results of trials so far carried out suggest however that the introduction of varieties into Africa from outside sources is unlikely to be a means of obtaining satisfactory sorghums for mechanized production. Where partial mechanization only is envisaged, production of dwarf types would not be essential, but work to isolate or breed higher yielding strains is regarded as necessary; local types should be collected for selection; introduced sorghums should be evaluated as possible material for hybridization. It is suggested that in general results may be obtained with the least delay by concentrating on selection within local varieties and searching for chance dwarf mutations. The cultural requirements of each variety also require investigation.
Appendix III gives notes on sorghum breeding in the United States, including the problems of the production of hybrid sorghum. Appendix IV lists some genetic characters of economic importance in breeding combine sorghums and indicates the nature of their inheritance. Notes on some of the varieties tested under the Mechanized Crop Production Scheme, Gedaref, Anglo-Egyptian Sudan, are presented in Appendix XIII. Appendix XVIII consists of a bibliography on sorghum production and includes a section on breeding, genetics and varieties.

1870. Martin, J. H.
Tailor made sorghums for industry and agriculture.
Crops and Soils 1951 : **3** : No. **5** : 20–23.

Achievements in breeding sorghum for different purposes in the United States are described and the chief varieties recently developed are listed. It is mentioned that breeders hope to produce F_1 hybrids of grain sorghum for commercial use, with the aid of male sterile strains.

1871. Evelyn, S. H.
Sorghum breeding in the Sudan.
World Crops 1951 : **3** : 65–68.

A general account is given of the uses of sorghum throughout the world, the origin of sorghum, classification, and the selection work and variety trials carried out in the Sudan during the period 1940–46. Evidence is presented in support of the view that the Kordofan province of the Sudan is the centre of origin of sorghum. A large number of introduced and local varieties and strains were tested at the Gezira Research Farm, prior to trials of the most promising material in the different parts of the Sudan; the many characters studied in the collection are listed. Conclusive and valuable results were obtained from the trials in the Blue Nile, Kordofan and Kassala provinces. Facts of interest in breeding work are briefly given on the following: resistance to *Striga hermonthica*, midge, common smut, bird attack and storage pests; leaf midrib colour as an index of stem characteristics; inheritance of panicle emergence, self compatibility and crossability; and the association of nitrogen content with grain size but not with grain colour.

1872. Garber, E. D.
Chromosome orientation in rings of four chromosomes at metaphase I in species of *Para-Sorghum*, genus *Sorghum*.
Amer. J. Bot. 1950 : **37** : p. 662. (Abst.).

The formation of a ring of four chromosomes at metaphase I of meiosis in species of *Para-Sorghum* may be interpreted on the basis of assuming either a random orientation in certain species or directed orientation in others. Reciprocal translocations causing semisterility result in the production of either open rings or zigzag rings in approximately equal numbers at metaphase I. At this stage a random twist of the interchange complex

is considered to be the basic difference between the two configurations. Two types of open ring and two types of zigzag ring configurations are possible at metaphase I. With directed orientation, assumed to be genetically controlled, the zigzag ring configurations predominate and increased fertility results. Ring quadrivalents in the autotetraploid of a diploid species, in which reciprocal translocations cause semisterility, behave as interchange complexes in that a twist is formed at random during metaphase I. Ring quadrivalents in the autotetraploid of a diploid species, in which chromosome arrangement in an interchange complex is genetically determined, show a high frequency of zigzag ring configurations at metaphase I.

1873. CHIAPPARINI, L.
Nuovi sorghi ibridi Americani da foraggio e da granella. (New American hybrid sorghums for forage and for grain).
Ann. Sper. Agrar., Roma 1951 : **5** : 21–47.

To ascertain the possible value of American hybrid sorghums for cultivation in Italy, 32 varieties of the forage and grain types were studied for one year. Their morphological and physiological characteristics are described and varieties of possible interest for dry, irrigated or wet regions in Italy are mentioned.

1874. MCNEILL, J. R.
The three hottest sorghums and how they perform.
Sth. Seedsman 1951 : **14** : No. 3 : 25, 52.

Additional information is reported on the field performances of Redbine 60, Redbine 66 and Combine Kafir 60 (cf. Abst. 343) in various districts.

RICE

1875. CHIAPPELLI, R.
Una nuova varietà: la "Stirpe 115." (A new variety: strain 115).
Risicoltura, Vercelli 1950 : **38** : 295–96.

The new strain, bred by Chiappelli from Lady Wright crossed with Nero Vialone is an early rice about 90 cm. high; it tillers well and has strong supple stems which on the rare occasions when they lodge, may return again to the erect position. It ripens about 15 days before Americano 1600 and may be sown as late as the second half of May. The attractive white grains are borne within reddish glumes. The 1000 seed weight is 40·5 grm.

1876.
Field trip to northern Honshu and Hokkaido.
Wkly Summ. Natural Resources Sect. Gen. Hdqrs Allied Powers, Japan 1950 : No. 265 : 15–30. (Mimeographed).

The following improvement work is described as a result of a visit of a representative of the Natural Resources Section to northern Honshu and Hokkaido:—

Furukawa Agricultural Improvement Experiment Station.
Work is limited to breeding rice varieties particularly adapted to the Tohoku region. All varieties cultivated in this area are being classified with respect to time of maturity, size and number of panicles, response to day length, sensitivity to temperature, resistance to blast and reaction to late transplanting. About 900 varieties and strains are grown in the breeding programme. A primary objective is blast resistance. At present the pedigree method is relied upon for this purpose but use of the back-crossing technique is envisaged. Other special studies in progress include: effect of excess nitrogen on lodging; relation of nitrogen supply to incidence of blast; varietal adaptability to warm nursery beds; and date of seeding and transplantation of different varieties.

Fujisaki Experimental Farm.
This farm of the Kurioishi Agricultural Improvement Station, Aomori prefecture, was established in 1935 to develop countermeasures for cold damage of rice. The temperature

of the water available for irrigation in this prefecture is normally 13° C., as compared with 18–20° for Tohoku as a whole. Damage from cold water has been found to be substantially the same as that due to cold air; a convenient means of testing varietal reaction to cold damage is therefore possible. Cold water causes most damage during the stage of heading. Considerable varietal differences in damage have been observed, not only in varieties differing in heading date but also in those heading at the same time. Varietal response to cold water applied before heading is not the same as response after heading; hence both must be considered in evaluating varieties. Cold water or air retards plant growth and development and causes sterility. Data are given on the sterility of 26 varieties due to exposure to cold water.

The new varieties Fujisaki 3 and Fujisaki 5 appear to be more resistant to cold damage than any others; they have not yet been distributed to farmers.

Varietal resistance to blast is also being determined. Resistance to leaf injury due to blast parallels injury to the peduncle, but correlation between the two forms of damage is low. Fujisaki 4 and Fujisaki 5 are regarded as the most blast resistant varieties. Extensive studies of varietal response to heavy fertilization are also under way.

Omagari Agricultural Experiment Station.

Situated in the Akita prefecture, this station was established in 1896 to conduct rice breeding and other investigations for northern Honshu. Under the reorganization plan the station will carry out basic research, particularly in connexion with breeding; no breeding work as such is to be undertaken. New varieties produced at Furukawa and elsewhere in the region will however be tested at Omagari.

One of the chief responsibilities of the station is the study of characteristics of varieties grown in the Tohuku region, such as tillering, number of grains per head, date of growth in nursery beds, and the relation of these to yield and adaptation. The following genetic factors have been discovered: *A* for rapid growth, *B* for number of tillers and *C* for number of grains per head. Heading date has been found to be governed by seven multiple factors. Other investigations include: ecological and genetic analysis of the rice Rikuu 132; varietal characteristics of winter cereals; varieties of rice suitable for upland fields; and experimental design. The four-plot system with plots randomized is now being used fairly extensively for varietal comparisons.

Akita Prefectural Agricultural Experiment Station.

Rice improvement by pure line selection and later by intervarietal crossing has been carried out since 1913. Determination of the adaptation of varieties to different sections of the prefecture is considered important; variety tests on private farms are therefore undertaken.

Yamagata Prefectural Agricultural Experiment Station.

Data on the yields of recommended varieties of wheat, barley and rice during recent years are given.

Hokkaido Agricultural Experiment Station.

Hybridization of blast resistant and relatively late maturing varieties from Honshu and elsewhere with early varieties from Hokkaido was begun in about 1920, to combine blast resistance and early maturity; the resulting varieties were resistant to blast but somewhat susceptible to low temperature. In 1931, breeding to develop varieties with medium maturity and resistance to cold weather was begun. Three methods of testing varietal resistance to cold are used: (1) exposure to cold water; (2) exposure to cold air in a temperature-controlled chamber; and (3) microscopic examination of the tapetal cells of rice which has been exposed to low temperature.

Several new varieties resistant to blast and moderately resistant to low temperature have been produced. Eiko, Norin 15 and Norin 20 are especially resistant to blast.

The use of hot beds for seeds facilitates the use of later maturing, blast resistant and higher yielding varieties.

Other important objectives are resistance to lodging, quality and tolerance of high levels of nitrogen fertilization.

A table showing the relation of temperature to cytological abnormalities and sterility is included.

Hybrid maize production is in progress. Extensive inbreeding of Japanese varieties is under way. Single and double crosses of American inbreds are being tested. Increases in grain yield in comparison with Japanese flint varieties range from 20 to 100%. The greater yield is partly due to the superiority of dent varieties over flint maize. Double crosses of Japanese inbreds yield about 15% more than the best of the parental varieties and mature earlier.

Kamikawa Branch Station.

This centre of the Hokkaido Agricultural Experiment Station is primarily concerned with rice breeding for resistance to low temperature and blast. Use is made of the pedigree, bulk and back cross methods. An experiment on variety mixing to test the efficiency of the bulk method gave results similar to those obtained with barley in California, viz. the most vigorous variety, but not necessarily the highest yielding, increased more rapidly than the others. Single, double and triple crosses are being investigated; transgressive segregation for earliness has been noted in some cases. In breeding for blast resistance, use is made of the back-crossing method; reaction to the disease is studied by means of artificial inoculation on the inner surface of the leaf sheath.

Data are given on yields of varieties for several years at the station; variety x year interactions are relatively large.

The information from the Kamikawa Station indicates (1) that standard errors expressing plot variability are often less than in the United States; and (2) that in view of the high interactions between year and variety fewer replications are required than would otherwise be necessary.

1877.

Études agronomiques sur le riz au Soudan Français effectuées par le Service agronomique de l'Office du Niger. (**Agronomic studies on rice in the French Sudan carried out by the Agricultural Service for the Niger**).
Gouvernement Général de L'Afrique Occidentale Française, Office du Niger 1950 : Pp. 64.

There are five races most commonly grown in the rice growing centres in the French Sudan: (1) Sornavari, an early rice introduced from India and retained for replacement sowings after locust damage owing to its ability to grow out of season; (2) Dissi-N-14, a selection by Vincent from a population from Guinea; and (3) Sikasso B, Sikasso H and Bentoubala 13, all three also selections by Vincent and derived from local hardy rices. The ripening periods of the last three are 160, 150 and 145 days respectively, compared with 110 for Sornavari and 140 for Dissi-N-14. An outline is given of the methods followed in maintaining varietal purity and in comparative trials of varieties in the rice collection.

Hybridization work is in progress to combine productivity and quality with the hardiness of the local rices, and the hybrids H 130 (Fortuna x Sikasso H) and H 520 (Java x Bentoubala B) have been compared with Sikasso H and Bentoubala B respectively with regard to yield, earliness, resistance to lodging and shedding, 1000 grain weight, and translucence and length of grains. H 520, though yielding 60% less than Bentoubala B, is worth further study and the best lines will be tested on a large scale with denser sowing.

Using Badami and Ramiah's method of pollination, new crosses have been made to combine the yields of varieties at present maintained by multiplication, Sikasso B and H, Bentoubala, Dissi and Sornavari, with the grain qualities of varieties Java, Trinidad and Nira (cf. Abst. 1087).

1878. Chiappelli, R.

Relazione sul concorso selezione sementi riso 1950. (**Report on the competition for rice seed selection, 1950**).
Risicoltura, Vercelli 1950 : **38** : 286–94.

In recording the results of this competition, whose main aim was the production of pure seed of rice varieties, two new productions are mentioned, Strain 115 (cf. Abst. 1875) and

Carnaroli. The latter is a fine grained rice with reddish spikelets. By hybridization other new varieties, not yet named, have been obtained that are productive and resistant to lodging.

1879. NAKAYAMA, K.
(On the manifestation of the genetically controlled dwarf habit in the young shoots of rice).
Bot. and Zool. 1940 : **8** : 384–94. [Japanese].

Studies are reported on the growth rate and histology of normal rice (*AABB*) and three dwarf types (*AAbb*, *aaBB* and *aabb*). The rate of coleoptile elongation is slower in the dwarfs, though in the case of *AAbb* plants the rate is the same as in normal plants till after four days from germination. The rate of mesocotyl growth is also different in the four genotypes studied. No significant differences between the normal and dwarf plants were detected in respect of the size of the cells in the coleoptile and in the mesocotyl.

1880. NAKAYAMA, K.
(On the manifestation of the genetically controlled dwarf habit in the young shoots of rice. II.).
Bot. and Zool. 1940 : **8** : 675–82. [Japanese].

Continuing his studies on the dwarf genotypes *AAbb*, *aaBB* and *aabb* (cf. Abst. 1879), the author reports the following results. The dwarf types and the normal *AABB* plants differ little in dry matter content. As regards length of the first few leaves, it is noted that the second and third leaves of *aaBB* plants are markedly shorter than those of *aabb* plants. The second and third leaves of *aaBB* plants are also thicker than those of the other genotypes. The motor cells of *aaBB* plants are better developed than those of the normal genotype. The four genotypes differ little in growth rate of the roots, but the number of roots is conspicuously different, the number declining through the sequence *AABB*, *AAbb*, *aaBB*, *aabb*.

1881. HARA, S.
(The wild rice of Formosa and its genetical characteristics).
Jap. J. Genet. 1942 : **18** : 183–84. [Japanese].

Oryza formosana, a wild species discovered in 1929, was found to have $2n = 24$ chromosomes. The author has made crosses between this species and one Japanese, one Korean and two Formosan varieties. The genetic basis of the following characters was studied in the F_2 of each cross: tillering, leaf morphology, colour of the apex of the unhulled grain and of the tip of the husk, awn length, red grain colour, and grain shedding.

1882. MORINAGA, T. and
NAGAMATU [NAGAMATSU], T.
[Linkage studies with rice (preliminary note)].
Jap. J. Genet. 1942 : **18** : 197–200. [Japanese].

A series of Japanese rice varieties have been crossed and the linkage values of the following characters have been calculated: coarse grain and husk tip colour; coarse grain and culm colour; absence of ligules and husk tip colour; absence of ligules and colour of the unhulled grain; degenerate ear and husk tip colour; and degenerate ear and culm colour.

1883. VAILLANT, A.
Le riz au Cameroun. **(Rice in the Cameroons).**
Agron. Trop. 1950 : **5** : 606–21.

The various aspects of rice production dealt with include (1) the origin of the cultivated varieties in Africa and in the French Cameroons, and (2) rice selection. Mass selection is the chief method of improvement. Results obtained at the Edéa and the Garoua Experimental Stations are tabulated to show the yields and provenance of the selections and strains undergoing trials.

1884. Nakayama, K.
[On the aftereffects of growth substance treatment on the rate of germination of dwarf rice (preliminary report)].
Jap. J. Genet. 1942 : **18** : 158–60. [Japanese].

Treatment with strong heteroauxin solution for 48 hours accelerated the shoot growth of dwarf rice, *aaBB*, but had little or no effect on normal rice *AABB*. The root growth responses to high and low concentrations were similar for both types.

1885. Morinaga, T.,
Kuriyama, H. and
Aoki, M.
(A sterile, extremely dwarf mutant of a diploid rice derived from a haploid).
Jap. J. Genet. 1942 : **18** : 297–304. [Japanese].

A sterile dwarf rice has segregated from a diploid strain of the variety Dekiyama in a recessive monohybrid ratio. The parent strain was derived from diploid tillers in a haploid line of the same variety.

1886. Murray, D. B.
Photoperiodism in rice in Trinidad with reference to a second crop.
Emp. J. Exp. Agric. 1950 : **18** : 271–75.

The rice Joya, a standard main crop variety in Trinidad, shows a marked photoperiodic reaction, which appears to be a main cause of the low yields of the second crop harvested in the middle of March. Other five month varieties exhibited a similar photoperiodic reaction to that of Joya. Introductions are being made in the hope of finding a variety adapted to the season of the second crop.

1887. Kerling, L. C. P.
Developmental processes of the rice-plant in relation to photoperiodism.
Proc. Koninklijke Nederlandse Akademie van Wetenschappen 1950 : **53** : 1428–41, 1617–33.

A report is given of experiments carried out at Buitenzorg, Java, to analyse the relationship between developmental processes and photoperiodism in rice, using the variety Untung, sensitive to day length, and Baok, with neutral photoperiodic response. In a discussion of the results in relation to breeding, it is stressed that knowledge of varietal differences in development and of the simple developmental characters involved in earliness is required. Guided by such information it should be possible, through hybridization and selection, to produce varieties combining high yielding capacity and developmental processes leading to earliness under certain conditions.

1888. Nagao, S. and
Kawamura, K.
(Studies on the hybridization of rice. II. Experiments on artificial hybridization of rice by means of emasculation with hot water).
Jap. J. Genet. 1942 : **18** : 56–68. [Japanese].

Panicles to be emasculated were immersed in hot water at 42–45° C. for 3 to 10 minutes. Treatment at 43° for 8 minutes gave the best results. Pollination was carried out about one hour after emasculation.

1889. Piacco, R.
Storia delle razze di riso coltivate in Italia. **(The history of the varieties of rice cultivated in Italy).**
Risicoltura, Vercelli 1950 : **38** : 222–38, 267–80.

Piacco, R.
Le razze di riso coltivate in Italia. **(The varieties of rice cultivated in Italy).**
Ibid. 1950 : **38** : 302–07; 1951 : **39** : 13–21, 34–43, 60–70.

The history of rices grown in Italy is traced from 1829, when the first reference to distinct varieties of rice occurs, up to 1949. The account, which is fully documented, also contains information on the types of rice imported at various times into Italy from Spain, Turkey, Egypt, USA, Bolivia, the Philippines, Java, Borneo, Indochina, Siam, Madagascar, China, Manchuria, Japan and India. Reference is made to the application of the principles of breeding by hybridization and selection to improve yields and grain quality.
Acclimatization is briefly discussed with special reference to the writer's recent efforts to introduce varieties superior to existing Italian rices in yield, grain quality, vigour and resistance to lodging and disease.
Some illustrations of rice panicles and tables showing the observed dates of ripening of large numbers of different varieties and strains of rice complete the survey.

1890. Nakajima, Y.
(On the resistance to cold of red grained rice).
Jap. J. Genet. 1942 : **18** : 163–65. [Japanese].

Exposure of normal and of red kernels of rice to 0·5–1·0° C. in the open air gave the following results: normal grains exposed in dishes of water lost their germination capacity; exposed in dishes of sucrose solution, a few grains were capable of germinating; finally, nearly all red grains were capable of germination regardless of whether the dishes containing them held water or sucrose solution.

FORAGE GRASSES

1891. Keller, E. R. and
Peterson, M. L.
Effect of photoperiod on red clover and timothy strains grown in association.
Agron. J. 1950 : **42** : 598–603.

Three timothy varieties, ranging in time of maturity from early to very late, and the red clovers Emerson, a type with medium maturity, and Mammoth, a late blooming variety, were grown alone and in mixtures under 10, 14 and 18 hour daily illumination in the greenhouse. Observations on flowering, growth characteristics, forage yields and top-root ratios are reported. Day length influenced the competitive relationships of red clover and timothy. Highly significant differences in forage yield were obtained which were attributed to photoperiod and variety combination. Variety of timothy or red clover did not influence the total yield of the mixtures.

1892. Hall, B. M.
Genetic analysis of interspecific hybrids in the genus *Bromus*, section *Ceratochloa*.
Genetics 1950 : **35** : 668–69. (Abst.).

B. catharticus, *B. Haenkeanus* and *B. stamineus*, each having a chromosome number of $2n = 42$, were hybridized. The F_1 hybrids had $2n = 42$, and showed a seed fertility of 5 to 15%, compared with the parental seed fertility of 95%. Tetraploid F_2 plants were obtained from colchicine treated F_1 hybrids. Both the 42 and 84 chromosome F_2 populations segregated for the morphological characters distinguishing the parents and also for

seed fertility. A correlation was found between segregation for morphological differences and segregation for fertility. In populations with $2n = 42$ the correlation was positive, i.e. the phenotypes differing most from the mean of their population tended to be more fertile. In the F_2 hybrids with $2n = 84$ the correlation was negative. Selfing and selection for seed fertility to the F_4 was accompanied by a fairly rapid decline in fertility in the tetraploid material; under the same conditions the lines with $2n = 42$ regained the fertility of the original parents. The pattern of segregation in the F_3 and F_4 resembled that observed in the F_2. Genetic instability, due to multivalent associations, appeared to be the chief cause of decrease in fertility of the tetraploids.

1893. Lemmon, P. E.,
Hafenrichter, A. L. and
Madson, B. A.
Cucamonga brome. A new grass for cover cropping.
Circ. Calif. Agric. Exp. Sta. 1950 : No. 401 : Pp. 7.

The brome grass Cucamonga, developed from plants collected in southern California, is recommended as a cover crop; as a forage crop it is of limited value on account of its early maturity.

1894. Knobloch, I. W.
Tetraploid brome grass.
Amer. J. Bot. 1950 : **37** : 663–64. (Abst.).

Two spontaneous tetraploid strains of *Bromus inermis* are reported. Mitosis is regular in these strains, but meiosis is irregular and resembles that in octoploids of the species. Morphological differences are not necessarily correlated with chromosome number, since tetraploid plants are encountered in both the broad and narrow leaved types.

1895. Griffiths, D. J.
The liability of seed crops of perennial ryegrass (*Lolium perenne*) to contamination by wind-borne pollen.
J. Agric. Sci. 1950 : **40** : 19–38.

The effects of isolation distance on intervarietal crosses in *Lolium perenne* have been studied at the Plant Breeding Station, Aberystwyth, using plants in which red coloration at the base is absent as indicators; these are homozygous recessives for the presence of anthocyanin.

Data show that contamination decreases rapidly at first with increasing distance, but there is progressive reduction in the rate of decrease with increasing isolation. The rate varies with the arrangement and number of plots.

The effect of intravarietal pollen in reducing intervarietal crossing resembles that of isolation distance. At short distances, additional rows of intervening plants will effectively reduce contamination, suggesting that cross pollination normally occurs between neighbouring plants.

The complications of contamination are reduced by growing varieties which differ widely in date of flowering in close proximity, although cutting back of an adjoining contaminating ley was found advisable to ensure varietal purity in a seed crop which flowers earlier or later.

1896.
Tercera reunión sobre plantas forrajeras. **(Third meeting on forage plants).**
Inform. Invest. Agríc. (IDIA), B. Aires 1950 : **3** : No. 35–36 : **1–10**.

The following items of interest to plant breeders were raised at the above meeting of Argentine and Uruguayan forage crop investigators.

Forage sorghums
Superior performances are reported for selections 4198 and 4203 of Sudan grass, lines 5232, 138 and 243 of sweet sorghum and selections 7073/48 and 7074/48 of black sorghum.
Efforts are being made to isolate lines of *Sorghum almum* devoid of rhizomes.
It has proved difficult to isolate lines of forage sorghums with a reduced content of durrhin, though some progress has been made.

Lucerne
Clonal differences in the incidence of hard seeds have been investigated. Mass selection has been applied for the production of nematode resistant types. Interest is being taken in rhizomatous lucerne recently introduced from Canada.

1897. Leukel, R. W. and
Martin, J. H.
Loose kernel smut of Johnson grass.
Phytopathology 1950 : **40** : 1061–70.

The smut commonly infecting Johnson grass in the United States is *Sphacelotheca Holci* and not a physiological race of *S. cruenta*. Tests of the reaction of Johnson grass, selections of Sudan grass and varieties and hybrid selections of sorghum to *S. Holci* and *S. cruenta* are reported. With few exceptions the sorghum selections exhibiting susceptibility to *S. Holci* were of known or probable origin from feterita; the kafir sorghums, which are susceptible to all forms of both *S. cruenta* and *S. Sorghi*, appeared to be immune from *S. Holci*. Johnson grass showed only slight susceptibility to *S. cruenta*; the Sudan grass selections remained free from infection with *S. Holci*.

1898. Burton, G. W. and
DeVane, E. H.
Starr millet.
Sth. Seedsman 1951 : **14** : No. **3** : 17, 68–69.

Cooperative investigations by the Georgia Coast Plain Experiment Station and the United States Department of Agriculture have produced a new variety of *Pennisetum glaucum*, Starr millet, which is a promising crop for temporary summer grazing on the light soils of the Coastal Plain. The progeny of a number of selfed plants selected from five Russian introductions, PI 115055–9, included a true breeding plant with very short internodes. This was crossed with common cattail millet, and numerous F_2 plants carrying the desired characters were selfed; true breeding progeny were crossed to produce the new variety. Compared with common cattail millet, Starr millet plants are short, but the tonnage of leaves per acre is greater and their relative fattening quality superior; the date of maturity is four to six weeks later. Although the new variety is susceptible to *Cercospora* leaf spot, this disease generally appears during seed formation and has little effect on the forage yield.

1899. Nagamatu [Nagamatsu], T.
(Ecogenetical studies on wild millet in rice fields. II. On the ecotypes of wild millet in the rice fields of the Fukuoka prefecture)
Jap. J. Genet. 1942 : **18** : 174–77. [Japanese].

Strains of *Panicum Crus-galli* var. *frumentaceum* were divisible into early maturing and late maturing types.

1900. Knaben, G.
Chromosome numbers of Scandinavian arctic-alpine plant species. I.
Blyttia, Oslo 1950 : **8** : 129–55.

Among the chromosome numbers reported are $2n = 10$ for *Anthoxanthum alpinum* and $2n = 16$ for *Astragalus frigidus*.

1901. Bor, N. L.
***Stipa hookeri* Stapf.**
Kew Bull. 1950 : No. 3 : 319–20.

An amended and extended description of *S. Hookeri* is given. *Timouria aurita* Hitch. is relegated to the synonymy of this species. The wider question of whether the so-called *S. Hookeri* is a *Stipa* or not is briefly considered. It is pointed out that the spikelet structure of *S. Hookeri* appears to be different from that of both *Stipa* and *Achnatherum*; probably further research will indicate that the relationships of the species are to be found elsewhere.

1902. Matsumura, S.
(Interspecific hybrids of Agropyron).
Kwagaku, Japan 1941 : **11** : 245–48. [from Jap. J. Bot. 1943 : **12** : Abst. 167].

Matsumura, S.
(Interspecific hybrids of Agropyron. II).
Jap. J. Genet. 1942 : **18** : 133–35. [Japanese].

No Japanese species of *Agropyron* that will cross with wheat have yet been found. In nature spontaneous crosses between species of *Agropyron* occur. The author has made artificial crosses between various species and the cytological features of the hybrid *A. ciliare* ($2n = 28$) x *A. semicostatum* ($2n = 42$) are here described in detail. The author concluded that both the parent species have two pairs of genomes in common, A_{cil} B_{cil} and A_{sem} B_{sem} and that *A. semicostatum* bears another genome, C, as well.
Six other hybrids were obtained and studied as regards their genomes, in particular *A. semicostatum* x *A. cristatum*, *A. yezoense* x *A. semicostatum*, *A. glaucum* x *A. obtusiusculum* and *A. elongatum* x *A. obtusiusculum.*

1903. Snyder, L. A.
Morphological variability and hybrid development in *Elymus glaucus.*
Amer. J. Bot. 1950 : **37** : 628–36.

Marked morphological and physiological differences were found in 24 strains of *E. glaucus* collected along a transect in the central Sierra Nevada. The study of 34 hybrid combinations, involving 20 of the strains, revealed that genetic isolating mechanisms are important in maintaining the morphological and physiological variation within the species. In only six of the hybrid combinations was the fertility sufficiently high to suggest the possibility of some exchange between the populations concerned. In 17 of the hybrids fertility was lower than 1%; the remaining hybrids showed sporophytic abnormalities ranging from failure of the hybrid seed to germinate to pronounced vegetative weakness and abortive inflorescences. No reciprocal differences were detected. The 20 strains involved in the hybrids investigated were tentatively placed in 15 ecospecies; one of these comprised four ecotypes, another two ecotypes. The remaining thirteen were each represented only by single ecotypes. On the basis of the data on morphology, cytology and hybrid fertility *E. glaucus* is considered to be a single, large and diverse cenospecies.

1904. Plank, H. K.
Studies of factors influencing attack and control of bamboo powder-post beetle.
Bull. P.R. [Fed.] Agric. Exp. Sta. 1950 : No. 48 : Pp. 39.

Variations in reaction to the powder post beetle, *Dinoderus minutus*, are reported from Puerto Rico, not only among the species but also among the varieties of bamboo. Using *Bambusa vulgaris* as a standard, the relative susceptibility of one-year old culms of 11 other species and varieties ranged from 44·2% in *B. vulgaris* var. *vittata* to 0·3% in *B. textilis*. Susceptibility was only slight in varieties of *B. Tulda*, *B. tuldoides* and a large-leafed variety of *Dendrocalamus strictus.*

1905. LECHNER, L.
Futterpflanzenzüchtung seit Kriegsende. (**Breeding of fodder plants since the end of the war**).
Neue Mitt. Landw. 1950 : 5 : 774–75.

In judging the value of a variety of forage plant used as breeding material more than the usual subjective estimation of the quantity of vegetation is required; the yield of seed must be determined and the extent to which any increase in yield is obtained at the expense of yield of seed.
Since 1945 five varieties of forage grasses, four of clovers, two of vetch, and one of lucerne have been admitted for test by the Research Institutes at Weihenstephan, Hohenheim, Giessen, Triesdorf and Voldagsen. The vetch Schweigers Frühe Graubraune [Schweiger's Early Grey-brown], derived from the Australian Grey-brown Summer vetch, is the earliest ripening of all varieties of vetch showing a moderate yield of green matter.

1906. CORMACK, M. W.
Variation in the cultural characteristics and pathogenicity of *Fusarium avenaceum* and *F. arthrosporioides*.
Canad. J. Bot. 1951 : **29** : 32–45.

In a study of variants occurring in isolates of the above two fungi from lucerne and other hosts in Alberta, it was noted that all the variants showed less virulence than their parental wild types in tests of infection on roots of lucerne and sweet clover. The necessity of using wild types of stable isolates in tests of varietal resistance is therefore emphasized.

1907.
Report of the Twelfth Alfalfa Improvement Conference July 31—August 2, 1950.
US. Dep. Agric., Agric. Res. Admin., Bur. Pl. Indust., Soils, Agric. Lethbridge, Alberta 1950 : Pp. 78. (Mimeographed).

Aamodt, O. S. — *Summary reports, progress and objectives in alfalfa investigations in the United States.* (*pp. 5–8*).

Current breeding and genetical work in the United States is surveyed. The chief breeding objectives comprise improvements in disease resistance, cold resistance and adaptation to local soil and climatic conditions, yield of forage and seed, ease of establishment and longevity of stands, forage quality, and resistance to stem nematode.
Methods used in lucerne improvement are listed and in some cases comments are made on their value. Introductions are receiving attention. Synthetic varieties are being developed but commercial hybrids resulting from controlled pollination appear to be a better economic proposition. Improved systems of utilizing hybrid vigour in breeding procedures are required. Genetical investigations include the analysis of morphological characters, particularly rhizomatous growth habit. Cytogenetical studies are being intensified to provide fuller understanding of the interrelationships of species, varieties and strains.
Finally, problems of insect pollination, seed production and setting now being studied and the objectives of varietal trials are enumerated.

Stevenson, T. M. — *Summary report of progress and objectives in alfalfa improvement work now in progress in Canada.* (*pp. 9–13*).

Canadian breeding work on the following is reviewed: resistance to diseases, particularly winter crown rot due to an unnamed basidiomycete, bacterial wilt, blackstem (*Ascochyta imperfecta*) and leaf spot (*Pseudopeziza Medicaginis*); persistence under grazing; tolerance of soil acidity; higher seed yield; improved forage production; resistance to winter injury caused by frost heaving; cold resistance; increased drought tolerance; and higher protein content. Cytogenetical experiments on polyploidy are also in progress.

Stanford, E. H. *Progress report on cytogenetics of alfalfa.* (*pp. 14–15*).

The problem of tetrasomic inheritance in lucerne is examined. In recent work by the author data on segregation for flower colour have been found to fit a tetrasomic ratio. Quadrivalents are sometimes formed at meiosis; presence of quadrivalents is not however conclusive evidence of the autotetraploid origin of lucerne, nor is their absence necessarily indicative of a lack of random pairing between genomes. So far it has not been possible to identify individual members of genomes at meiosis. Much more extensive studies are therefore required to indicate to what extent tetrasomic inheritance occurs. The practical significance of the slower rate with which homozygosity is obtained in breeding work as a result of tetrasomic inheritance is briefly discussed.

Stanford, E. H. *Report of committee on nomenclature of genetic characters and factors in alfalfa.* (*pp. 15–16*).

The functions of the Committee are defined and discussed. The work of cataloguing and assigning genetic symbols has not yet been completed. An effort to enlist the cooperation of workers in other countries is to be made. Among the topics discussed is the maintenance of genetic stocks.

Aamodt, O. S. *Alfalfa in Argentina.* (*p. 17*).

Some observations made on lucerne production during a visit to Argentina are presented. Mention is made of a new nematode resistant variety, Facultad, developed by G. A. Tomé at the University of Buenos Aires; the variety is being increased for distribution in the near future.

Smith, O. F. *Some diseases of alfalfa in western United States and their relation to alfalfa improvement.* (*pp. 19–21*).

California Common shows some degree of resistance to dwarf virus; certain introductions from Turkistan and Iran are resistant to stem nematode.

Henderson, R. G. *Alfalfa diseases in Virginia.* (*p.* 22).

Some progress has been achieved in breeding for disease resistance but it is evident that considerable time will be required for the development of a satisfactory variety. The new lucerne Williamsburg (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 255) is tolerant of the disease complex in eastern Virginia but cannot be regarded as resistant to many of the chief diseases. Selection of this variety is now in progress; probably lines with greater tolerance can be secured. Another objective of lucerne improvement in Virginia is the development of a variety resistant to stem nematode.

Panel discussion on alfalfa diseases in Canada. (*pp. 23–26*).

Dealing with investigations on the winter crown rot caused by an unnamed basidiomycete, J. B. Lebeau briefly described work on developing a resistant variety, which has been initiated at the Dominion Laboratory of Plant Pathology, Edmonton, Alba., in cooperation with the Dominion Forage Crops Laboratory, Saskatoon; several clonal lines have shown resistance. R. W. Peake outlined the technique used for testing resistance to bacterial wilt.

Henderson, R. G. *Report of the committee on screening of alfalfa breeding stock.* (*pp. 27–30*).

A summary is given of the results of a questionnaire circulated to investigators of lucerne in the United States and Canada, by means of which information on problems of disease and insect attack and agronomy at present under investigation has been collected. Evaluation of breeding stock should be carried out on a cooperative basis of exchange of material and information.

White, W. J. *Field trip.* (*p. 31*).

Rhizomatous derivatives of *Medicago sativa* and *M. falcata* and the technique used for eliminating plants susceptible to bacterial wilt in the nursery were among the demonstrations seen by members of the conference upon their visit to the Dominion Experiment Station, Lethbridge, Alba.

Bohart, G. E. *The alkali bee,* Nomia melanderi *Ckll. A native pollinator of alfalfa.* (*pp. 32–35*).

Within their range alkali bees are the most important among the wild pollinators of lucerne in Utah. Their advantages and disadvantages with regard to commercial seed production are analysed.

McMahon, H. *The pre-selection of locations in which alfalfa seed can be profitably produced in northern areas of western Canada.* (*pp. 36–37*).

Attention is being given to the problem of maintaining and increasing seed yields in the northern districts of western Canada, where larger cultivated acreages have greatly reduced the native habitats and thus the populations of *Megachile* and *Bombus* spp.; these bees were responsible for the generally high seed yields produced when these districts were first settled. Honey bees have so far been found to be of little or no value for tripping and cross-pollinating lucerne in the northern regions. Studies are in progress to discover whether honey bees are nevertheless potentially useful in seed production and on the precise role of *Megachile* and *Bombus* spp. in cross pollination. For the present, efficient utilization of virgin areas for seed production is recommended.

Jones, L. G. *Increased production of alfalfa seed through honey-bee pollination.* (*pp. 38–40*).

The use of pollinating honey bees for seed production in California is outlined.

Todd, F. E. *Problems in the use of honey bee pollinators in alfalfa.* (*pp. 41–46*).

A description of the technique of utilizing honey bees to pollinate lucerne in Arizona is included.

Hobbs, G. A. *Pollinating species of bees in the irrigated regions of southern Alberta.* (*pp. 47–49*).

Megachile (*Xanthosarus*) *dentitarsus* is responsible for most of the tripping of lucerne in southern Alberta. Various ways of increasing the effectiveness of this wild bee as a pollinating agent are discussed.

Carlson, J. W. *Insects in relation to alfalfa seed setting.* (*pp. 54–55*).

At the Legume Seed Laboratory, Logan, Utah, the following factors are being considered in tackling the complex problem of seed setting ability: (1) inherent seed yielding capacity, growth and reproductive development, cultural treatment and management; (2) insect and disease control, including breeding for resistance; and (3) tripping and pollination, comprising the factors of insect pollinators, floral development and response, embryology and postfertilization development. The importance of the different factors is estimated largely on the basis of yield and quality of seed. Analysis along these lines has been fruitfully applied in the study of *Lygus* bug infestation.

Graumann, H. O. *Performance of "C" clones and their polycross progeny.* (*pp. 57–58*).

Data obtained on the so-called C clones and their polycrosses in tests at seven stations in the eastern United States are summarized. Out of 222 C clones, 4 were classified as outstanding and 53 intermediate. Certain clones with special characters likely to be of

interest in genetical studies are listed. Promising clones not yet given C numbers were increased respectively for the production of polycrosses.

Heinrichs, D. H. *Breeding for creeping rooted alfalfa.* (*pp.* 59–61).

Breeding work on hybrids between Ladak (*Medicago media*) and Siberian (*M. falcata*) at the Dominion Experimental Station, Swift Current, Sask., is described. The work aims at the production of a creeping rooted, drought resistant lucerne for pastures in the Canadian Prairies. Ladak selections with a spreading crown and low crowned plants of *M. falcata* with a creeping tendency were used as parents. The first phase of the programme entailed evaluation of selected plants by open progeny tests, intercrossing the most desirable parent plants, selection of the progenies, and back-crossing or intercrossing the resulting selections. The parentage of nearly all the plants with a strong tendency to creep could be traced back to seven *M. falcata* parents; a fairly large number of Ladak plants produced creeping rooted progeny in crosses with the seven *M. falcata* parents, but certain plants of Ladak combined better than others for the creeping rooted character. Selections are being tested for general and specific combining ability, to provide data for the establishment of synthetic groups each consisting of 4 to 8 plants. The hybrid lines show a much stronger tendency to creep than *M. falcata*, even in segregating generations. Ladak also contributes considerably to the expression of this character. Probably many genes control the habit of creeping root, some of which may be complementary. In addition, the hybrid lines possess considerably greater resistance to winter killing than Ladak and other control varieties; correlation between percentage winter survival and creeping root habit was 0·6, significant at the 1% level. Synthetic lines were established in 1950 for grazing and clipping tests.

Bolton, J. L. *Progress in breeding for resistance to winter crown rot.* (*pp. 62–64*).

In Canada *M. falcata* has been found to be the best source of resistance to crown rot. In tests of selfed, intercrossed and outcrossed progenies, promising levels of resistance have been secured. Development of lines combining resistance to both winter crown rot and bacterial wilt is also in progress. The less desirable characters of *M. falcata* are gradually being replaced by those of *M. sativa* or *M. media* in developing lines resistant to winter crown rot, but considerable testing, selection and recombination are still required for the production of synthetics with satisfactory winter crown rot resistance and other characters.

Armstrong, J. M. *Self-sterility studies in alfalfa.* (*p. 65*).

The possibility of using highly self sterile plants in the production of hybrid lucerne has been studied at the Central Experimental Farm, Ottawa. Highly self sterile plants of Ladak were intercrossed in a diallel series and the inheritance of self sterility was analysed; the crossability of related and unrelated F_1 plants was also investigated. Self sterility was found to be due to (1) meiotic irregularities, (2) poor pollen production resulting from physiological disturbances in pollen maturation, or (3) self incompatibility. Plants of types (2) and (3) are recommended for the production of double cross seed. Self sterility was reduced if self sterile plants involving different factors for sterility were intercrossed but was unaltered if the plants possessed a similar genotype for this character; it was therefore concluded that F_1 crosses should be effected between plants possessing the same type of genotype for sterility if intercrossing of related plants is to be kept to a minimum in the succeeding double cross.

Hanson, C. H. *Alfalfa breeding procedure under investigation in North Carolina.* (*pp. 66–67*).

Breeding is being carried out according to Crandall's technique of pattern selection and the method of recurrent reciprocal selection developed by Comstock *et al.* (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 263). The ultimate aim is the production of a synthetic variety, the seed of which will consist of an appropriate mixture of the component parts. During 1950, selections from the most persistent and productive lines were divided into four groups on the basis of origin. Intercrossing was allowed within each group; open-pollinated seed

was harvested from the 50 best plants remaining in each group after further selection prior to flowering. The following steps will complete the first cycle of breeding by 1954: (1) selfing of selected open-pollinated progenies; (2) establishment of the S_1 progenies in an isolated block so as to bring about the maximum crossing between lines from different groups; (3) harvesting of polycross seed in 1952; (4) polycross progeny tests in 1953; (5) in 1954 identification of superior lines on the basis of disease and insect resistance of the S_1 generation and of yield in the polycross progeny tests; (6) transplantation of desirable segregates in the superior lines to isolated blocks, each selection being returned to the group from which its parent belonged; and finally (7) natural crossing within each group. Thus, four unrelated groups of lines are being built up, each combining well with the other groups. During each cycle there will be an opportunity of testing synthetic combinations of the best clones; with each successive cycle the chances of obtaining superior synthetics should improve.

Hodgson, H. J. *Alfalfa investigations in Alaska.* (*p. 68*).

Varieties of *M. sativa* are insufficiently winter hardy for Alaska. *M. falcata* has shown complete survival during winter but this species has the drawbacks of seed shattering and poor seedling vigour. It is hoped to develop a suitable winter hardy type by hybridization between the two species, followed by back-crossing to *M. falcata*, or selection of bulk populations of advanced generations. Isolation of superior plants from old stands of *M. falcata* is now in progress; selected plants will be evaluated for combining ability with a view to the production of synthetics; they will also be used in crosses with *M. sativa*.

Murphy, R. P. *Brief summary of discussion on plant breeding during the twelfth alfalfa improvement conference.* (*pp. 69–71*).

Use of the term hybrid for synthetic varieties was discussed. The author urges restriction of the term to the F_1 generation of selected parents.

Attention was drawn during the conference to the possibility of selection for tolerance of acid soils: selection of *Rhizobium* strains with superior nitrogen-fixing capacity on lucerne growing in acid soils should also be considered.

In connexion with the possible autotetraploid origin of lucerne, at least to some extent, the author suggests that use of one-year selfed progenies should provide suitable material for testing. If plants triplex for a desired gene show a satisfactory performance and some degree of dominance of the desired character exists, such plants should be nearly as desirable as quadriplex ones. This method seems most useful for qualitative characters with tetrasomic inheritance; it should also be valuable in studying qualitative characters inherited on a disomic basis. Several investigators have suggested that one-year selfed lines may be utilized in the development of hybrids of synthetics. The production of homozygous inbred lines appears to be unnecessary in lucerne.

Emphasis is laid on the need for actual experiments to test theories on the number of lines required for a synthetic.

Development of varieties resistant to all the major diseases and insect pests present in both the areas of forage production and the regions of seed production requires a number of years for its achievement: in those areas where lucerne is used for forage, and seed production is not feasible, primary emphasis upon breeding for resistance to the diseases and pests serious in the area of forage production is urged.

Intensified analysis of the various causes of reduction in stands is recommended as a guide to breeding.

Suggestions are made concerning the functions of the Committee on Screening of Alfalfa Breeding Stock.

The best clones will largely result from second and third cycles of breeding systems; the success of selection in the second cycles may perhaps be traced to the good material secured from progenies produced by intercrossing the material forming the starting point, as in the case of breeding for resistance to winter crown rot, seed production and creeping root habit in Canada.

It is further suggested that more information is required on (1) the relationship between the performance of clones and that of the various types of their progenies and on the

relationships between the performances shown by these types of progenies; (2) the value of pattern selection and reciprocal recurrent selection; and (3) the conditions under which the different classes of certified seed should be produced. The latter problem should be a concern of the breeder and experiment station.

Discussion on numerical rating of plant characters. (*p. 73*).

Continuation of the system adopted in 1945 was agreed upon, i.e. the recording of data on plant characters according to a scale of 0 to 10, with the lowest figure representing the most desirable expression of a given character. A similar method of recording has been used in compiling the FAO catalogue of genetic stocks. The conference would like to encourage other plant breeders to use this system in order to facilitate the summarizing of data and coordination of improvement work.

1908.

Narragansett, hardy alfalfa for the Northeast, is released by Rhode Island after extensive tests.
Crops and Soils 1951 : **3** : No. 6 : p. 28.

The lucerne Narragansett has been bred from crosses between several varieties and strains. It is vigorous and hardy, with a much branched root system. It produces high yields of forage and seed, and has given promising results in the United States, Canada and Alaska.

1909. Gelin, O.
Lusern-nytt. (**Lucerne news**).
Weibulls Ill. Årsb. 1950 : **45** : 32–33.

From the Flemish type of lucerne, which seems likely to be hardy enough for Swedish conditions, the Ormelong strain was derived from which by further selection the varieties Ile de France and Du Puits (cf. Abst. 139) were obtained. According to Danish findings and experiments at Weibullsholm, both these selections with two other strains, Chartainvilliers and Weibull 268, also derived from the Flemish type, give very high yields of green matter, at least 10% more than Grimm. All four should be cut early as they tend to form numerous coarse stems, though their remarkable productivity is probably entirely due to their rapid development. According to Danish experiments three cuts should be taken in the first year and four in the second and third years. Their seed production has also been reported as good in Denmark and they should, it is thought, prove valuable varieties for Swedish growers.

1910. Cavazza, L.
Beitrag zur Erkennung von hartschaligen Leguminosensamen. (**Contribution to the identification of hard coated seeds of legumes**).
Schweiz. landw. Mh. 1950 : **28** : 378–80.

The differences between hard and soft seeds in four species of *Trifolium*, two of *Medicago* and two of *Lotus* were investigated. Results showed that the hard seeds were nearly always smaller, of lower 1000 seed weight and of higher specific gravity than the soft seeds. Since the yellow and the violet coloration of red clover seeds are hereditary it is thought probable that the tendency to form hard seeds is also conditioned by hereditary factors.

1911. Caputa, J. and
Rapin, J.
Influence de la provenance des semences sur le développement et le rendement de la luzerne et de quelques graminées fourragères. (**The influence of the provenance of seed on development and yield of lucerne and some forage grasses**).
Rev. Romande Agric. Viticult. Arboricult. 1951 : **7** : 4–6.

This article records the performance of lucerne from Provence, Languedoc, Italy, Hungary and Canada, in tests by the Mont-Calme Experimental Station at Beau-Cèdre, Lausanne.

The results are compared with those from previous trials and include records of yields, cold and drought resistance, and suitability for conditions in Switzerland.

1912. Lesiņš, K.
Investigations into seed setting of lucerne at Ultuna, Sweden, 1945-1949.
Kungl. LantbrHögskolans Ann. 1950 : **17** : 441–83.

The results of experiments on seed setting in lucerne carried out at the Ultuna branch station of the Swedish Seed Association during the period 1945–49 are reported. Ultuna, it is pointed out, is at the northern boundary of lucerne growing.
Seed yields were unstable and often very low, ranging from complete failure to 560 kg. per ha.; higher and more reliable yields were secured during the first year of utilization, i.e. second season growth.
Pod setting without tripping averaged 2·7%, calculated on the basis of all tripped plus withered flowers in 5–day tests during two seasons. It was further estimated that 38·5 kg. per ha. of seed would be produced as a result of this percentage of pod setting without tripping.
Under natural conditions, controlled cross pollination by honey bees increased pod setting, seed setting and seeds per pod on the average by 2·24, 5·20 and 2·32 times, respectively, as compared with controlled self pollination. Under artificial conditions the absolute values for each character in question were larger in both groups, but the increase was distinctly greater in the self-pollinated group; this suggests that embryos from self fertilization are more susceptible to the less favourable environmental conditions prevailing under field conditions. Data are also given for the number of flowers per unit of area, weight of seed, and seed set from controlled self and cross pollination per 100 flowers under field and artificial conditions.
Wild bees, particularly *Bombus terrestris*, are very effective tripping agents but occur in numbers too low and unstable for reliable seed production. Honey bees accelerate tripping but their efficiency is greatly influenced by various factors. Cross pollination without tripping insects, due to wind and scattering by non-pollinating insects, is of negligible economic importance.
Automatic tripping under natural conditions ranges from 19·5 to 64·9%. Variation in automatic tripping and seed development after tripping is considered to be one cause of the unreliable and often very low seed yields. Varietal differences in the amounts of automatic tripping were recorded. The causes of automatic tripping are discussed; experiments were carried out on methods of determining the capacity of automatic tripping; in 1949 the drying action of wind appeared to be the main cause of automatic tripping.
Various climatic, soil and biotic factors may influence seed development; attention is drawn to the role of insects, such as *Adelphocoris lineolatus* and aphids, in diminishing seed production as a result of injury to buds and flowers.
Cultural practices recommended for improving seed production are outlined. Breeding methods applied in countries other than Sweden for raising seed yields in lucerne are reviewed; an attempt has been made at Ultuna to estimate their value under Swedish conditions. A method of fractionating pods according to weight, corresponding to their origin by natural or cross pollination, has been successfully applied as a means of securing increased seed production.

1913. Allison, J. L. and
Hanson, C. H.
Methods for determining pathogenicity of *Sclerotinia trifoliorum* on alfalfa and *Rhizoctonia solani* on *Lotus*.
Phytopathology **1951** : **41** : p.1. (Abst.).

The reactions of 75 strains of lucerne to *Sclerotinia Trifoliorum*, and 101 strains, varieties and species of *Lotus* to *Rhizoctonia Solani* have been recorded in North Carolina. A small number of plants, resistant to the respective pathogens, were isolated for breeding purposes.

1914. Jones, F. R.
Susceptibility of alfalfa plants to *Colletotrichum trifolii*.
Plant Dis. Reporter 1950 : **34** : p. 344.

In both the greenhouse and nursery certain selfed lines and crosses of lucerne were far more susceptible to *C. Trifolii* than others at Madison, Wisc. Susceptibility appeared to be inherited from a few plants used recently in crosses. Combinations of susceptible parent plants gave populations as highly susceptible as the sweet clover selection on which the fungus first attracted attention. *C. Trifolii* has been rarely recorded as far north as Wisconsin but these observations suggest that use of highly susceptible lines of sweet clover or lucerne might result in injury of economic importance even in this state.

1915. Čižikov, N. V.
(Wild clovers of the Jaroslavlj province).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 6 : **31–37.** [Russian].

Wild clovers of the Jaroslavlj province consist of two types, an early form with few internodes and a late form with seven, eight or nine internodes. The latter grows 60 to 80 cm. high and flowers at the same time as the late cultivated varieties. It is as productive as the cultivated varieties and has great economic importance. A naturally selected hardy population in the Maslovskiĭ district is regarded as suitable for immediate use in industry. The hardy cultivated Jaroslavlj clover is assumed to have been selected by Samarin from indigenous populations and not from the early west European two-cut clovers, which are susceptible to cold, as Lisicyn suggested. A change in the method of clover selection is proposed consisting of the transfer of plant breeding activities from the research stations to the districts in which promising wild clovers occur in nature.

1916. Makarova, A. G.
(A promising clover variety).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 6 : **45–47.** [Russian].

The selection of a clover population cultivated in the Špoljanskiĭ district at the Mironovskiĭ State Breeding Station has given a promising new two-cut variety Mestnyĭ Tolmačskiĭ [Local Tolmač], which has been submitted for state trials. It is hardier, more productive and less susceptible to drought than the standard variety Belocerkovskiĭ 3306 [Belaja Cerkovj 3306].

1917. Crall, J. M.
Wilt of red clover seedlings.
Phytopathology 1951 : **41** : p. 7. (Abst.).

Numerous isolates of *Fusarium oxysporum, F. Solani, F. roseum* and *F. moniliforme*, from red clover plants showing wilt symptoms in an Iowa field plot, were used in pathogenicity tests on the varieties "common," Kenland, Emerson and Midland. Data on reduced yields are reported; Kenland was most resistant and "common" most susceptible to all the isolates.

1918. Kiełpiński, J. and
Sołtys, J. A.
Badania nad wpływem wartości osmotycznej środowiska na przebieg kiełkowania nasion koniczyny czerwonej różnego pochodzenia. **(Studies on the effect of the osmotic pressure of the medium on the course of the germination of seeds of red clover from different sources).**
Prace Rolniczo-Leśne, Kraków 1950 : No. 52 : Pp. 38.

Applying Buchinger's method (cf. *Plant Breeding Abstracts*, Vol. VII, Abst. 603), 58 samples of red clover from England, Denmark, Sweden, Switzerland, France, USA and Poland were

used in investigating the relation between provenance of seeds and their resistance to plasmolytic solutions of various concentrations.
The seeds were allowed to germinate in cane sugar solutions of strengths from 0·30 to 0·55 N. It was found possible to divide the clovers into six groups, according to the maximum suction pressures of the seeds in each group.
The results show that observation of the course of germination in a cane sugar solution of strength 0·40 N could probably provide an indicator for distinguishing provenance, winter hardiness and resistance to drought of various ecotypes of red clover.

1919. Bingefors, S.
Klövernematoden och dess bekämpande genom resistensförädling.
(The clover stem eelworm and its control by resistance breeding).
K. LantbrAkad. Tidskr. 1950 : **89** : 420–34.

Much of the substance of this article has already been reviewed in *Plant Breeding Abstracts'* Vol. XIX, Abst. 2630 and Vol. XXI, Abst. 396.
The difficulties of breeding stem eelworm resistant strains of red clover suitable for southern, central and northern Sweden are discussed and the achievements at the Svalöf and Ultuna Stations of the Swedish Seed Association, working in cooperation with the Royal Swedish Academy of Agriculture in research on this problem, are recorded. One strain, U 036, a tetraploid combining resistance with winter hardiness, has already been bred at Ultuna (cf. Abst. 871).

1920. Dessureaux, L.
Variation in the seed setting ability of Ladino white clover.
Sci. Agric. 1950 : **30** : 509–17.

Data on the mean number of seeds per floret and percentage of seed bearing florets of large numbers of individual plants and clonal lines of Ladino white clover examined in north eastern Canada during 1948 and 1949 are given.
Wide variations in seed setting ability indicate that this character is heterozygous. The high degree of heterozygosity is being maintained by cross-pollination. Selection and intercrossing of the best seed-setting plants appear to offer a practical method of increasing seed production.

1921. Atwood, S. S. and
Brewbaker, J. L.
Multiple oppositional alleles in autoploid white clover.
Genetics 1950 : **35** : p. 653. (Abst.).

Earlier work has shown that sectors with doubled chromosome number, resulting from colchicine treatment, were self incompatible like the parent plants. An F_1 family from two plants with such sectors consisted of 3 self incompatible and 26 self compatible plants; when the latter were used as males, all intercrosses and back crosses were compatible; when the parents and self incompatible F_1 plants were used as males, both compatible and incompatible matings occurred. The study has been extended to 16 F_2 families obtained by selfing and crossing F_1 plants and parents. The F_2 families segregated in the expected ratios of self incompatible and self compatible plants. In addition, when the F_2 plants were crossed with the self incompatible parents and F_1 testers, the incompatibility reactions conformed to those of the F_1. The results are explained on the following basis. Homozygous diploid pollen behaves similarly to haploid pollen, i.e. in the regular oppositional manner, whereas heterozygous diploid pollen either functions or fails according to the "dominance" or "interaction" behaviour of the *S* alleles in each pollen grain. The four alleles from the two original parents appear to have the following dominance relationships: $S_2 > S_3 > S_4 > S_1$. The genotype S_2S_4 is the only one showing interaction in the pollen; all plants producing this type of pollen are not only self compatible but also cross compatible in all combinations when used as male parents. Varying degrees of self and cross compatibility depend upon the proportion of functional pollen and the degree of dominance in the heterozygous pollen.

1922. NAKAYAMA, K.
(On aberrant leaflet production in clover).
Bot. and Zool. 1941 : **9** : 519–26. [Japanese].

Figures are given for the frequency of quadrifoliate and quinquefoliate leaves in F_2–F_4 progeny of Japanese samples of *Trifolium repens* with supernumerary leaflets.

1923. MATTHEWS, D. L. and
BATTLE, W. R.
A survey of variability in alsike clover (*Trifolium hybridum* L.).
Agron. J. 1951 : **43** : 45–46.

Variability in 20 strains from the United States, Canada and Europe was studied at the New Jersey Agricultural Experiment Station. The following coefficients of variability are reported; leaf shape, 10·7; leafiness, 12·5; per cent dry weight, 19·1; stem length, 28·8; growth habit, 30·3, flower colour, 36·7; date of bloom, 37·9; plant height, 40·0; number of stems, 50·3; number of flowers, 55·9; and yield, 68·6%. European strains tend to be uniform whereas strains from the United States show a trend towards variability.

1924. DANNIK, S.,
PODGAEVSKIĬ, M. and
EGOROVA, N.
(*Onobrychis arenaria*, a valuable perennial plant).
Kolhoznoe Proizvodstvo (Collective Farming) 1950 : No. 9 : 26–27. [Russian].

Mention is made of hybrids OD–8 [Odessa 8] and OD–10 [Odessa 10] bred at the USSR Institute of Breeding and Genetics from *O. arenaria*. The hybrids are productive and resistant to drought under Odessa conditions.

1925. PIETERS, A. J.,
HENSON, P. R.,
ADAMS, W. E. and
BARNETT, A. P.
Sericea and other perennial lespedezas for forage and soil conservation.
Circ. U.S. Dep. Agric. 1950 : No. 863 : Pp. 48.

A section describing species and varieties is included; a brief survey of the literature on the chromosome numbers in the genus *Lespedeza* is also given.

1926. *LAMBERTS, H.
Problemen bij de lupineveredeling. **(Problems in breeding lupins).**
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) 29 January, 1948 Wageningen : 194–203. (Mimeographed).

The cultivation and breeding of lupins are recent developments and it is desirable that wild varieties in the gene centres of the Mediterranean area and America, along the west coast from Chile to Canada, should be sought. In the former area *L. luteus*, *L. angustifolius* and *L. albus* occur, while in the latter area there is greater variation, with the perennials *L. polyphyllus* and *L. perennis* in the north and *L. mutabilis* in Brazil.
The history and utilization of the lupin in Europe are referred to, mention being made of the marked variation of species in their alkaloid content. Successful breeding to reduce the alkaloid content has been due largely to the extensive genetic studies of von Sengbusch in Germany, whose achievements in lupin improvement have been regularly reviewed from time to time in *Plant Breeding Abstracts*.

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* An extended summary is on file at the Bureau.

The species *L. albus* is regarded as specially promising economically. Though it requires better soil, the yield of green matter and seed from the alkaloid free types is higher than in *L. luteus*; and the oil content averages 11%, with a maximum of 17%. According to German reports an early ripening variety of *L. albus* may have already been obtained.

1927. Covas, G.
Un híbrido interespecífico natural en "Amaranthus". **(A natural interspecific hybrid of *Amaranthus*).**
Rev. Argent. Agron. 1950 : **17** : 257–60.

The hybrid *A. edulis* x *A. hybridus* is described. The two parents have the same chromosome number ($2n = 32$), and 16 bivalents are formed during meiosis in the hybrid.

ROOTS AND TUBERS

1928. Medvedev, P. F.
(The results of clonal selection of *Cyperus esculentus*).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 7 : 78–79. [Russian].

C. esculentus is cultivated in the USSR for its oil, protein and sugar content. In selection work at the Kubanj Research Station of the USSR Institute of Plant Industry, the Pyrenean and American sedges proved earlier and more productive than the African forms. Clonal selection of Pyrenean material has given the early varieties M–1 and M–2, which have well developed tubers.

1929. Hörberg, Y.
Allmänna råd till odlare av rotfrukter. **(General advice to growers of root crops).**
Weibulls Ill. Årsb. 1950 : **45** : 13–18.

This article, which deals with advice to growers on matters relating to cultivation, is accompanied by six illustrations of strains of mangels, sugar mangels and swedes with notes on their characteristics and suitability for some types of soils.

1930.
Statens forsøg med stammer af foderroer. **(Government trials with strains of fodder beets).**
Tidsskr. Frøavl 1950 : **54** : 159–60.

Danish trials of mangels, fodder mangels and sugar beets for fodder (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 988) are recorded for the period 1944–47, and similar results are given for comparative trials of strains of swedes during 1940–43. A coloured plate shows the shape and colour of the roots in both series, and a note is appended on the varietal resistance to club root in highly infected soil.

1931. Mizushima, U.
Karyogenetic studies of species and genus hybrids in the tribe Brassiceae of Cruciferae.
Tohoku J. Agric. Res. 1950 : **1** : 1–14.

Data are given on chromosome pairing at metaphase I in the microsporogenesis of interspecific hybrids of *Brassica* and intergeneric hybrids involving *Brassica*, *Sinapis*, *Eruca* and *Raphanus*, and their bearing upon genomic relationships is discussed.
Among the interspecific *Brassica* hybrids, *B. carinata* (BC) x *B. chinensis* (A), [amphidiploid *B. campestris* x *B. oleracea* (AACC)] x *B. nigra* (B) and *B. nigra* x *B. oleracea* (C) are considered in detail. In the first two hybrids, having the genome ABC, the highest number of bivalents was nine and ten respectively. In the diploid hybrids BC, between *B. nigra* and *B. oleracea*, four bivalents were observed. Data from hybrids of the

constitution AAB and AAC and the amphidiploids BBCC gave little evidence of autosyndesis between B and C. Thus partial homology between B and C was indicated. The difference in the frequency of bivalents in the two types of hybrids with the genome ABC, viz. BC–A and AC–B, is explained as follows. In the former type bivalents are attributed to allosyndesis between A and C and between A and D, neither allosyndesis nor autosyndesis affecting the BC component; in the latter type bivalent formation occurred between any two of the three monogenomes, A, B and C.

In the intergeneric hybrids, the following partial homologies were established on the basis of allosyndetic pairing; between A, B, C and S from hybrids of monogenomic and digenomic *Brassica* species with *S. arvensis*; between A and R from hybrids of *B. Rapa* with *R. sativus*; and between S and R from hybrids of *S. arvensis* with *R. sativus*.

It is concluded from the results of the author and previous investigators that all the genomes of the species studied are partially homologous and of secondary polyploid origin from a common genome. It is emphasized that as differentiation of the caryotype proceeds, the problem of the origin of aneuploidy becomes increasingly complicated.

1932. MIZUSHIMA, U.
On several artificial allopolyploids obtained in the tribe Brassiceae of Cruciferea.
Tohoku J. Agric. Res. 1950 : **1** : 15–27.

Investigations of chromosome behaviour at microsporogenesis have been carried out with 17 amphidiploids of different genome constitution, obtained by colchicine and acenaphthene treatment of interspecific and intergeneric hybrids of *Brassica, Eruca, Raphanus* and *Sinapis*.

Meiosis in digenomic tetraploids was regular; autosyndesis occurred in all except *B. nigra-oleracea* and *B.–S. nigra-arvensis*, where some quadrivalents were formed. In the digenomic and trigenomic hexaploids, varying numbers of quadrivalents and univalents produced unbalanced aneuploid gametes. Tetraploid material, rather than higher polyploids, will therefore be preferable for breeding improved crops in the Brassiceae on the basis of fertility of the gametes.

All the digenomic tetraploids and two digenomic hexaploids, which were derived from self incompatible monogenomic species, showed self incompatibility but were compatible in open or cross pollination. The remaining hexaploids, derived from self-compatible digenomic and self incompatible monogenomic species, were self compatible, but their fertility depended largely on the degree of regularity of meiosis.

A discussion of the genetical mechanism of incompatibility involved the use of Kakizaki's hypothesis of a series of *T* factors in addition to the allelomorphic series of *S* factors; the relationships of apparently incompatible groups which become compatible are dependent upon autosyndesis of homologous genomes, resulting from chromosome doubling.

1933. HÖRBERG, Y.
Weibulls original Bangholm, stam 36. Ny stam med mycket högt odlingsvärde. (**Weibull's Bangholm, strain 36. A new strain of high practical value**).
Weibulls Ill. Årsb. 1950 : **45** : 34–35.

This new Bangholm strain of swede is superior to other Bangholm strains in yield and has a smooth, large root with a very small neck and has well developed foliage. It is also recommended for its club root resistance and good keeping property.

1934. ANDERSEN, J. C.
Krydsningsfaren mellen Kaalroe og Raps. (**The danger of crossing between swede and rape**).
Tiddsskr. Frøavl 1951 : **20** : 135–36.

Swedish observations on crossing among seed plots of swedes and also between rape and swedes are cited to show the need to avoid this risk in raising pure seed for the maintenance of strains or for commercial purposes.

1935.

Resistant type of rape for areas infected with club root.
N.Z. J. Agric. 1951 : **82** : 65–66.

The successful performance of the rape Club Root Resistant in New Zealand is described. The type was selected from material originally introduced from France; it is recommended for cultivation on land where club root occurs. No recommendation is made that this type should displace Broad Leaf Essex or Giant where either of these can be grown free from club root.

1936.

Forsøg med stammer af kålroer 1946–1949. (**Trials with strains of swedes 1946-49**).
Tidsskr. Planteavl 1950 : **54** : 181–84.

Descriptions are given of the characteristics and performance of strains of swedes tested on different types of soil at nine Danish experimental Stations. Wilhelmsburger, Trifolium X showed the highest total dry matter, 91·2 hkg. per ha., with a yield of roots equal to 755 hkg. and of tops equal to 80 hkg. per ha., and a dry matter content of 12·1%. Bangholm, Pajbjerg X gave a very high yield of roots, 798 hkg. per ha., but the dry matter content was only 10·9%.
In trials run on club root infected soil Wilhelmsburger, Øtofte X and E proved the most resistant and gave the highest total yield of dry matter, 57·1 hkg. per ha.

1937.

Twenty-first Annual Report of the Executive Council, Commonwealth Agricultural Bureaux 1949-50. Appendix IV. Commonwealth Potato Collection. 1951 : 28–31.

Improved diploids are being selected, which are to be crossed with *Solanum demissum* to obtain tetraploid breeding lines.
Immunity from virus Y was confirmed in most of the species previously reported as promising, but mid-winter tests with *S. Rybinii* (CPC 979) suggested that this clone is not completely immune. Analysis of 44 clones of *S. demissum* indicated types with several different reactions to virus Y. Inoculations with virus Y were also carried out on hybrid seedlings having the highly resistant clone CPC 979 as one parent; resistant seedlings were selected for further testing.
Further tests of foliage reactions to *Phytophthora infestans* have resulted in the addition of *S. colombianum, S. Bulbocastanum* and *S. Andreanum* to the 1948 list of species containing resistance. Blight resistance has also been found in certain lines of *S. cardiophyllum, S. lanciforme, S. demissum, S. semidemissum, S. longipedicellatum* and *S. tlaxcalense.*
In South Africa certain CPC lines have withstood attacks of *Alternaria Solani*; since October 1948, tests have therefore been carried out at the Commonwealth Potato Collection to discover whether true genetic immunity or resistance is present in CPC material. Lines have been classified for resistance on the basis of lesion size. No line has shown immunity from the South African isolate. The highest degree of resistance has been found in certain wild diploids of the group *Commersoniana,* e.g. *S. saltense, S. Schickii* and *S. tarijense.*
The reactions of CPC lines to a strong strain of *Synchytrium endobioticum* was examined by T. Steyer at Leipzig. Lines found to be free from the disease or susceptible are listed. The majority of lines exhibiting freedom from dry rot (*Fusarium caeruleum*) or the highest degree of resistance belong to *S. andigenum* and *S. stenotomum,* but some are representatives of *S. Yabari, S. tenuifilamentum, S. tuberosum* and *S. curtilobum.*
S. Ballsii continues to show promising resistance to potato root eelworm.
In tests of CPC material carried out in Canada certain lines of the following species proved the most resistant to Colorado beetle: *S. capsicibaccatum, S. gibberulosum, S. Jamesii, S. jujuyense, S. Parodii, S. Schickii, S. sucrense, S. tarijense* and *S. violaceimarmoratum.*
Data on relative frost resistance obtained from freezing chamber tests on CPC lines have corresponded with those from field experiments. The frost resistance shown previously by some clones was confirmed; resistance was detected in a few additional wild diploid lines.

1938.

Potato Industry Conference, Glen Innes, 7th February, 1950.
Div. Pl. Ind., Dep. Agric., NSW 1950 : Pp. 12. **(Mimeographed).**

Orman, A. C. — *A review of the potato research work of the New South Wales Department of Agriculture.* (*No. 2*: *Pp. 5*).

The genetic characteristics sought in new varieties adapted to the conditions of New South Wales during the past twenty-one years are described. Recently, high yield, disease resistance and good tuber characteristics have been achieved in the varieties Monak, Moona and Adina, but special attention is now being given to the development of field resistance to virus diseases, especially leaf roll. All the varieties grown commercially are susceptible. A seedling produced in Canberra, known as 11–84, from the cross USDA 41956 x (Snowflake x Katahdin), is being used as the main parent for crosses with other promising varieties; it is immune from virus X, Y and A and has a good resistance to leaf roll.
The varieties Cayuga, Ontario, Seneca, Russet Burbank and Menominee, introduced from the US, are being used to breed varieties resistant to *Actinomyces scabies*. Menominee has also been used as the resistant parent in crosses to produce progeny with resistance to *Alternaria Solani*. Further varieties with field immunity or good resistance to *Phytophthora infestans* are being sought from resistant parents such as Ackersegen, Kennebec, Sebago and Saranac.

Caroll, J. G. — *An outline of potato breeding work by the N.S.W. Department of Agriculture.* (*No. 3*: *Pp. 6*).

Some of the essential features of the potato breeding programme, described by A. C. Orman, are given more extensive consideration.

1939.

Potato improvement. . . . Potato industry field day and conference. New England Experiment Farm 7th-8th February, 1950.
N.S.W. Dep. Agric. Pp. 16.

The report of potato breeding at the New England Experiment Farm, New South Wales, gives an account of the varieties Monak, Moona and Adina (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 365), developed in 1948. Another selection, S 2514, from the cross Pontiac x Katahdin, has shown promise of tubers with improved shape; it is undergoing field tests.
Extensive trials have culminated in the presentation of lists of the varieties best adapted to each of the main potato growing areas.
Breeding for resistance to virus diseases and late blight is continuing. Varietal trials for lines resistant to scab are being made in the Orange district of the Central Tablelands; it is hoped to incorporate such material into the breeding programme. New varieties continue to be tested for their reaction to the potato moth.

1940. Aljsmik, P. I.
(The arrangement of potato varieties into groups, according to their morphological and biological characters, for application to breeding).
Agrobiologija (Agrobiology) 1950 : No. 4 : 100–09. [Russian].

A study of *Solanum tuberosum* at the White Russian State Breeding Station showed that potato varieties consisted of three distinct groups, each of which could again be subdivided into three types, according to their morphological and biological properties.
The first group of varieties was remarkable for low branching of the main stems. The plants of the second group had non-branching stems. The third group comprised late

maturing varieties with luxuriant leaves, whose development has a deleterious effect upon tuber formation.
The group and type of a variety are indicative of its yielding capacity and other biological properties. Crosses between varieties belonging to different morphological and biological groups give more productive progenies than crosses between varieties of the same groups and types. The yield records of the following hybrids, with notes on the biological grouping of the parent forms, are given: 1413 x Chippewa, 1413 x Katahdin, 1413 x Fanfare, 1413 x Leptostigma, Kornea [Cornea] x 8745, 34c x 8745, 1226–39 x 8745 and 1681 x 8745. The material with non-branching stems is more susceptible to physiological degeneration and shows a better response to various agrobiological training methods including summer planting, than the varieties in the branching stem group.
Reference is made to the following new potato varieties obtained by Mičurinite training and selection at the Institute; Agronomičeskiĭ [Agronomical], Trudovoĭ [Labour], and Partisan, all three resistant to wart, and Belorusskiĭ 5780 [White Russian 5780] and Belorusskiĭ: 746–36, both susceptible.

1941. Ramanujam, S.
Problems and prospects of potato improvement in India.
Indian J. Genet. Pl. Breed. 1950 : **10** : 1–6.

Use is being made of several South American species including *Solanum Antipoviczii*, *S. demissum*, *S. curtilobum*, *S. Rybinii*, *S. Phureja* and *S. andigenum* at the Indian potato breeding stations, where it is hoped to produce commercially acceptable hybrids adapted to subtropical localities.
At Patna, large numbers of self and open pollinated progenies have been produced from the variety Phulwa, showing wide variations in certain characters; it is possible that selection and breeding will produce uniform progeny from those plants with desirable characters.

1942. Swaminathan, M. S.
Einige Verfahren für die Verwendung wilder *Solanum*-Arten zu Zuchtzwecken. (**Some methods of using wild *Solanum* species for breeding purposes**).
Züchter 1950 : **20** : 358–60.

In the breeding of potatoes, the use of the newly obtained amphidiploid hybrids *Solanum acaule* x *S. simplicifolium*, *S. Macolae* x *S. simplicifolium* and plants of *S. longipedicellatum* in which the chromosome number has been doubled is suggested. Examples of the procedure are given in detail. *S. Macolae* has been found to be resistant to the Colorado beetle. According to unpublished work of H. J. Toxopeus, *S. longipedicellatum* is resistant to some of the *Phytophthora* biotypes which have been isolated in Holland.
The colchicine-agar method of doubling the chromosome number, the use of 8-hydroxyquinoline with orcein for making preparations and the application of an aqueous solution of α-naphthyl acetic acid for preventing flowers from falling when the temperature is fairly high are described.

1943. Hagberg, A. and
Tedin, O.
Inter- and intraclonal crosses and inbreeding in potatoes.
Hereditas, Lund 1951 : **37** : 280–87.

Experiments were carried out at Svalöf to investigate the effects of inbreeding in potatoes and the claims made by the Lysenko school that crosses between plants within a clone lead to increased vigour as compared with the results of selfing. Marked degeneration occurred in the F_1 after inbreeding. Crossing between different plants within a clone showed no stimulating effect. Seed setting was better after interclonal crossing than selfing. Reciprocal interclonal crosses showed considerable differences in tuber yield. It

is suggested that these may be due to differential elimination of genes in the male and female parents associated with the differences in fertility of the two sexes; but possibly the cause of the reciprocal differences may be more complex.

1944. Bonifacio, P.
Risultato di prove di innesto con alcune Solanacee. (Result of graft experiments with some Solanaceae).
Riv. Ortoflorofrutticolt. Ital., Firenze 1951 : **35** : 42–43.

Successful bud grafts are reported in which *Solanum latifolium* was used as the stock, and egg plant, tomato or pimento as the scion. The technique is simple and resulted, in this experiment in Sicily, in a good yield of egg fruits and tomatoes about a month earlier than the crops obtained in the highly favourable conditions of Palermo.

1945. Trulevič, V. K.
(Experiments on vegetative hybridization of potatoes).
Sad i Ogorod (Fruit and Vegetable Gardens) 1950 : No. 12 : 61–63. [Russian].

Grafting experiments with the potato varieties Kurjer [Courier], Rannjaja Roza [Early Rose] and Imandra at the Narjan-Marskaja Zonal Station of the Institute of Arctic Agriculture are reported. The account includes a description of a new device facilitating the excision of eyes of scion varieties to fit the conical cavity made in the tuber of the stock varieties.
The most productive vegetative hybrids were Kurjer on Rannjaja Roza and direct and reciprocal grafts between Imandra and Rannjaja Roza.
The tubers harvested comprised 45% of the stock type, 22·7% of the scion type and 32% of the intermediate type. The tubers of the intermediate type included several variegated ones. These resulted from the grafts of Rannjaja Roza on Imandra and on Kurjer. Imandra and Kurjer have white tubers.

1946. Swaminathan, M. S.
Notes on induced polyploids in the tuber-bearing *Solanum* species and their crossability with *Solanum tuberosum*.
Amer. Potato J. 1951 : **28** : 472–89.

Chromosome doubling in *Solanum* species has been induced at the Institute of Genetics, Wageningen, with the following aims: (1) to double the chromosome number of species with $2n = 24$ chromosomes, possessing valuable characters from the point of view of breeding, in order to cross them with *Solanum tuberosum*; (2) to produce forms with $2n = 96$ chromosomes from certain species where $2n = 48$, which do not normally cross readily with *S. tuberosum*; and (3) to obtain amphidiploids from sterile F_1 interspecific hybrids. Seed treatment with 0·5% colchicine in agar has proved to be a very successful method. The growth habits, morphological characters and fertility of chromosome double forms of *S. chacoense*, *S. Kesselbrenneri*, *S. Rybinii*, *S. polyadenium*, *S. acaule*, *S. longipedicellatum*, *S. Macolae* x *S. simplicifolium* and *S. acaule* x *S. simplicifolium* are described.
Reciprocal crosses of doubled plants of *S. chacoense*, *S. Kesselbrenneri*, *S. Rybinii* and *S. Macolae* x *S. simplicifolium* with *S. tuberosum* were successful. Crossing between doubled *S. polyadenium* and *S. tuberosum* was only effected when the latter was the female parent. Crossing of *S. acaule*, *S. longipedicellatum* and *S. acaule* x *S. simplicifolium* with *S. tuberosum* was successful only when *S. tuberosum* was used as the male parent. The possible value of triple interspecific hybrids in breeding is briefly discussed. The desirability of planning interspecific hybridization within the section *Tuberarium* in such a way as to maintain the chromosome number of $2n = 48$ in hybrids to be crossed or back-crossed with *S. tuberosum* is stressed.

1947. Noonan, J. C.,
Webb, R. E.,
Attaya, R. B. and
Miller, J. C.
Influence of location on the ascorbic acid content of the Irish potato.
Amer. Potato J. 1951 : **28** : 521–24.

The potato varieties LaSoda, DeSoto, Katahdin, LaSalle and Triumph were grown at five centres in Louisiana for two years. Significant differences in ascorbic acid content due to location are reported; varietal differences in this property were not significant. Highly significant differences due to variety were obtained in the case of dry weight but differences due to year and location were even more important.

1948. Terman, G. L.,
Goven, M. and
Cunningham, C. E.
Effect of storage temperature and size on French fry quality, shrinkage and specific gravity of Maine potatoes.
Amer. Potato J. 1950 : **27** : 417–24.

The effect of storage temperature on the quality of five potato varieties was investigated at Maine Agricultural Experiment Station; it was shown that after storing at 36° or 40° F conversion of starch to sugars limits their value for chip making. Kennebec, which has a low specific gravity, was the only variety unaffected by six months' storage at 50°. A reconditioning process of maintaining the potatoes at 60° or 70° for 20–38 days was successful in reducing the sugar content in all varieties. Shrinkage and specific gravity increased appreciably with increasing storage duration and decreasing temperatures, and slightly with decreasing size of tubers.

1949. Oniščenko, A. I.
(Improvement of fruit setting in potato crosses).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 7 : 48–51. [Russian].

In experiments, conducted at the Ukrainian Scientific Research Institute of Vegetable Growing, the fruit setting of potatoes was improved by treatment with a 0·01% solution of α-2,4-dichlorphenoxy-p-butyric acid. Appreciable increases in seed setting were obtained in the crosses Ella x Katahdin, Virulana x Oktjabrenok [Little Octobrist] and Grenzmark x Ella. Viable seed was also obtained with the help of this substance from self-fertilized S 1004–4, a variety developed at the Uljjanov Potato Station which shows promise under Ukrainian conditions. Seed from this selfing was planted in 1949 with the object of selecting for resistance to wart.

1950. Oniščenko, A. I.
(The depth of root distribution in the potato).
Agrobiologija (Agrobiology) 1950 : No. 4 : 157–61. [Russian].

The results of a study of root systems of eight early, fourteen mid-season and eight late varieties of potatoes at the Ukrainian Scientific Research Station of Vegetable Growing are reported. It was found that varieties developed in the central and southern belts of the USSR had more vigorous and more extensively branching root systems than varieties bred in northern Russia. The root systems of the early varieties were shallower than those of the mid-season and late varieties.
Smyslovskiĭ, a mid-season variety, has a vigorous root system and other good economic properties which it transmits readily to its hybrid progenies.

1951. Pal, B. P. and
Pushkarnath.
Indian potato varieties.
Bull. Indian Coun. Agric. Res. 1951 : No. 62 : Pp. 63.

Detailed descriptions of the morphological and physiological characters of 28 commercial potato varieties, commonly cultivated in India, are presented. The physiological characters referred to comprise maturity, yield, cooking quality, keeping quality and reaction to virus and fungous diseases. The descriptions are based on observations recorded in the hills of northern India where the potato flourishes and grows normally. Notes are however given on the main differences found when the same varieties are cultivated in the plains. The relative importance of the different varieties in commercial production and as breeding material is indicated. A list of Indian synonyms of commercial varieties is appended.

1952. *Zaĭceva, N. D.
(Initial material for potato breeding).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 7 : 31–37. [Russian].

The breeding value of wild species and primitive forms from Bukasov and Juzepczuk's potato collection is discussed.
Some Chilean forms of *Solanum tuberosum* such as *elegans latum*, *Villa-royale* 8835, *chilotanum*, *indianum* 8851, *Caballera* 8911 and *Lisa* 8901 show remarkable resistance to arid soils and effects of high temperatures. Of the 24 Chilean samples of *S. tuberosum*, 22, including *chilotanum* 8829, 8832 and 8835 and *viride*, proved resistant to wart. They were however susceptible to black leg and ring rot.
Tuber formation in *S. andigenum* is helped by short day conditions, but some forms develop tubers without shading. The average yield per plant under normal long day conditions is 80 grm., but some forms, notably K-40 var. *Calvacii* and var. *longibaccatum*, yield appreciably more. The hybrid progenies of *S. andigenum* are productive and yield tubers with a high starch content. The crosses with *S. tuberosum* present little difficulty. *S. andigenum* is later in developing than *S. tuberosum* and its dormant period is longer. It is suggested that the long dormant period should be used for breeding varieties that do not germinate in arid seasons. The study of resistance to wart in 41 forms of *andigenum* showed that only two forms, Lima and *lilacinoflorum*, were susceptible to the disease.
S. demissum is resistant to frost and some of its forms also to *Phytophthora*. The *tlaxpehualcoense* samples 024, 029, and 022/01, *xitlense* No. 29 and Vilmorin Nos. 0249/056, 037, 0245/C–9 and 0234/C–4 also give progenies resistant to *Phytophthora*, while *xitlense* Nos. 010 and 063 and *tlaxpehualcoense* 014 and 023 give progenies susceptible to *Phytophthora* although they themselves are resistant. *Tlaxpehualcoense* samples 022/C–6, 026, 030, 022/012, 0223/C–5 and *demissum* Nos. 0250/028, 0220/010, 0247/C–1, 0248/C–9 and 0233/C–91 proved *Phytophthora* resistant, but the resistance of their progenies has yet to be tested. *S. andigenum* hybridizes readily with the domestic varieties and it is being used in breeding for resistance to frost and *Phytophthora*. Several hybrids were obtained at the Institute of Potato Farming which passed immunity tests in infection trials conducted for three years. *S. andigenum* shows resistance to Colorado beetle and to crinkle.
S. semidemissum is hardy and resistant to *Phytophthora*. It showed no symptoms of black leg in artificial infection trials. Several hybrids obtained from crosses between the species and the variety Smyslovskii [= Fürstenkrone] were either resistant or only slightly susceptible to *Phytophthora*.
S. curtilobum is resistant to drought and frost and gives hardy progenies when cultivated near the arctic circle. However its resistance to cold in the Leningrad province is low. The species crosses with ease with the domestic varieties and its hybrids produce tubers with a high starch content.

* An extended summary of this paper is on file at the Bureau.

Fertile hybrids are rarely derived from *S. Punae,* but recently, several vegetative hybrids, besides Gibrid Blagovidovoĭ [Blagovidova's Hybrid], have been obtained at the Institute of Potato Farming by a method involving the use of domestic varieties as mentors. The progenies of these hybrids showed resistance to cold.
S. Antipoviczii showed higher susceptibility to *Phytophthora* in the trials at the Institute of Potato Farming than was expected, but the *neoantipoviczii* forms 0272 and 0276/058 proved resistant to infection. *S. Antipoviczii* var. *Martinezii* showed resistance to wart. *S. Molinae* forms show resistance to drought and wart disease. *S. leptostigma* is resistant to drought. *S. Commersonii* shows resistance to Colorado beetle and some forms are resistant to frost and wart. Crosses with the domestic varieties are difficult to obtain. *S. cuencanum* is remarkable for its early maturity. *S. Juzepczukii* is hardy. It does not cross readily with the domestic varieties. *S. dolichostigma* is resistant to drought and Colorado beetle and is less susceptible to *Verticillium* than other *Solanum* species. In artificial infection trials it showed resistance to black leg and ring rot. *S. Phureja* shows resistance to wart. Samples 8072 and 8076 remained free from black leg and ring rot in artificial infection trials. *S. stenotomum* requires testing for resistance to wart. *S. canarense* is probably resistant to crinkle. *S. Rybinii* appears to possess resistance to crinkle and black leg. It is being used in breeding early varieties for cultivation in the south of the USSR. *S. boyacense* has early maturity and a short dormancy period. *S. Kesselbrenneri* has early maturity and appears to possess resistance to ring rot and black leg. *S. Bukasovii* is resistant to frost and may be resistant to wart and scab. It hybridizes readily with the domestic varieties. *S. Jamesii* shows resistance to wart and Colorado beetle. It is probably resistant to black leg and ring rot.

1953. Hawkes, J. G.
The Commonwealth Potato Collection.
Amer. Potato J. 1951 : **28** : 465–71.

An account is given of the Commonwealth Agricultural Bureaux expedition to South America carried out in 1939 to collect potato material and of the results of subsequent testing for disease resistance and other characters during the years 1941 to 1948 at Cambridge. The second phase of work has now been started. Investigations on the crossability of the species have been intensified and research on the inheritance of genes conferring resistance to disease and on the cytology of the hybrids is being carried out. Recently, wild potatoes from Colombia and Mexico have been added to the collection; of the specimens from the former country the diploid species *Solanum Andreanum,* apparently blight immune, is the most interesting.

1954. Jacob, W. C. and
Dean, L. A.
The utilization of phosphorus by two potato varieties on Long Island.
Amer. Potato J. 1950 : **27** : 439–45.

Experiments on the rate of phosphorus application and its utilization by Irish Cobbler and Green Mountain at Cornell University Agricultural Experiment Station have illustrated the existence of varietal differences in the accumulation of phosphorus; the isotope P^{32} was supplied as a fertilizer. No significant yield responses to phosphorus application were noted in either variety compared with controls.

1955. Schaper, P.
Kartoffelkrankheiten und ihre züchterische Bekämpfung. (**Potato diseases and their control by breeding**).
Neue Mitt. Landw. 1950 : **5** : 846–47.

The difficulties in breeding potatoes resistant to *Phytophthora infestans,* Colorado beetle and virus diseases are discussed.

In Germany fields of the varieties Aquila, Monika, Maritta and Panther, which remained free from *Ph. infestans* for years, were completely destroyed last year, owing to weather favouring the increase of a more virulent race of the fungus. Certain wild species, cultivated varieties and hybrids, however, have been tested with all available races of the fungus and many have so far proved resistant; from these it is hoped to evolve varieties for cultivation. As many wild species as possible will be introduced into a single hybrid with the aim of producing an ultimate combined resistance, which may be complete. Again, the seedlings of many wild and cultivated varieties, though attacked, show differences in the rate of spreading of the fungus. Such plants exhibit good field resistance, fitting them for use in hybridization with wild species.
Selection from the resistant wild species *Solanum chacoense*, *S. demissum* and *S. polyadenium* for wild types which will be 100% lethal to the Colorado beetle is to be followed by crossing with cultivated varieties and subsequent breeding for increased yield.
No cultivated varieties or wild species or primitive types of potato fully resistant to leaf roll are yet known, but amongst types from the Andes there are forms showing high field resistance which might be used in breeding.
Several wild species are known, each of which is immune to one of the three virus diseases, mosaic, crinkle and streak. Moreover, many varieties show an immediate protective reaction and though no known variety exhibits this reaction towards all three diseases, some varieties show it towards two. The complementary partners, including if necessary a wild species, should be chosen to produce a hybrid giving full immunity to all three diseases.
In recent years a number of varieties relatively resistant to degeneration have been bred, so that besides Ackersegen, Flava and Aquila there are now also Atlanta, Corona (Ragis), Forelle (von Moreau), Fortuna (Asche), Aldeheid (von Zwehl) and Carmen (von Pohl), all worthy of the cultivator's interest owing to their low susceptibility to viruses.

1956. Schultz, E. S.
Investigations on potato diseases by the Bureau of Plant Industry, Soils, and Agricultural Engineering, United Stated Department of Agriculture, 1910 to 1949.
Plant Dis. Reporter 1950 : Suppl. 195 : 413–19.

Varietal differences in reaction to late blight, wart, scab and virus diseases are surveyed and the achievements of breeding for disease resistance are briefly indicated.

1957. Oniščenko, A. I.
(Potato varieties developed at the Uljjanov Research Station, in the Ukraine.)
Sad i Ogorod (Fruit and Vegetable Gardens) 1950 : No. 11 : 66–67. [Russian].

In Ukrainian trials the varieties S 1004–4, from Epicure x Katahdin, S 157–3, S 170–3, Uljjanovskiĭ [Uljjanov], and S 161–21 proved resistant to drought and high temperatures. The varieties were developed at the Uljjanov Potato Research Station in the Povolžje.
S 1004–4 is a productive mid-season variety yielding good quality tubers. Unfortunately, it is susceptible to wart and its cultivation must be limited to the Stalino, Vorošilovgrad and Harjkov provinces where varieties susceptible to the disease are permissible.
S 157–3 is early maturing and resistant to wart and physiological degeneration. The variety is more productive, particularly in arid seasons, than the other early varieties. It is promising for all Ukrainian districts.
S 170–3 is an early variety with a higher yielding capacity than Rannjaja Roza [Early Rose].
Uljjanovskiĭ and S 161–21 are among the most productive varieties of the mid-season group.

1958. Tamm, V. T.
(Wart resistant potato varieties in the Estonian SSR).
Sad i Ogorod (Fruit and Vegetable Gardens) 1950 : No. 11 : 68–69.
[Russian].

Several wart resistant potatoes bred at the Iygev Breeding Station, Estonia, are described.
Kalev, from Pepo x Edzell Blue, is a productive mid-season maturing variety suitable for table use and for animal feeding. The tubers are large, white, round and with few eyes. They keep well. The variety yields up to 600 c. per ha.
Iygeva Piklik [Iygev Piklik] was obtained from Majestic x Centifolia. It is a mid-season table and forage variety with good keeping properties. The tubers are white, large and elongated, with shallow eyes. The yield of tubers is 18·8% and of starch 21·7% higher than those of the standard.
Iygeva Kollane [Iygev Kollane] was bred from the hybrid 942–30 x Alpha. It is a late variety resistant to *Phytophthora* and yields 12% more tubers and 32·9% starch than the standard. The tubers are round and large with shallow eyes. The skin and flesh are yellow. The variety keeps well.
Linda, from hybrid 953–30 x P. Knappe 5, is a mid-season table variety. It produces more starch and a higher tuber yield than the standard. The tubers are large and elongated and have shallow eyes. Their skin is white and flesh yellow. They have a good flavour and keep well.
Virulane, from Golden Wonder x Pepo, is a mid-season variety which has various uses. It has a high starch content and is resistant to virus diseases. Virulane is susceptible to *Phytophthora*. It outyields the standard. The tubers are oval, white and have shallower eyes. Their flavour and keeping properties are good.
Uku, from Virulane x Mittelfrühe [Mid-early], is a late variety which has various uses. It has a higher starch content and is more productive than the standard. The tubers are large, oval, white and shallow-eyed. They keep well. References are made to clonal selection and the method for growing superélites at the Iygev station.

1959. Turlapova, A. P.
(Towards new progress in potato farming).
Sad i Ogorod (Fruit and Vegetable Gardens) 1950 : No. 11 : 63–65.
[Russian.]

Some of the most important varieties of potato bred by Mičurinite methods at various Soviet institutes after the war are listed.
The varieties Agronomičeskiĭ [Agronomic], Zvenjevoĭ [Detachment], Trudovoĭ [Labour], Partisan and Zazerskiĭ bred at the White Russian State Breeding Station are superior to the standards. Zvenjovoĭ and Agronomičeskiĭ are remarkable for their earliness and Partisan and Zazerskiĭ for good flavour and keeping properties, the former outyielding the standards on mineral and peat soils. The tubers of Trudovoĭ contain 21% starch.
The most promising varieties resistant to wart, developed at the Estonian State Breeding Station, are Iygeva-Piklik, Kungla, Iygeva-Kollane, Linda, Muljk, Kalev and Virulane.
An early variety resistant to wart, Priekuljskiĭ Raniĭ [Early Priekuljskiĭ], was selected at the Priekuljskaja Research Station, Latvia.
Other early wart resistant varieties, Imandra, Murmanskiĭ [Murmansk] and Severnaja Roza [Northern Rose] were developed at the Arctic Section of the USSR Institute of Plant Industry. An important variety for the Soviet central Asiatic republics is Bogarnyĭ [Rain Fed] which possesses resistance to wart and is moderate in its water requirements. It was bred at the Šortanda Research Station, Kazahstan.
A new mid-season variety Oktjabrenok [Little Octobrist], which shows resistance to wart and was developed at the Petrovskaja Station, was made a standard in several western provinces of the USSR where the disease is prevalent.
New varieties resistant to drought, Uljjanovskiĭ [Uljjanov], Volžanin [Volgaman] and Sejanec 161–24 [Seedling 161–24], were developed at the Uljjanov Research Station.
Two promising varieties, Moskvič [Moscovite] and Peredovik [Leader], of which the former shows resistance to *Phytophthora*, were developed at the Institute of Potato Farming.

An early variety resistant to drought, Voronežskiĭ [Voronež] was selected at the Voronež potato station.
A variety adapted to severe climatic conditions of the Narym territory, Narymčanin [Narym Dweller], was bred at the Polesje Research Station in the Ukraine and hardened by its subsequent training at the Narym Research Station.
Similarly, the variety Sibirjak [Siberian] which was bred at Omsk was trained for cultivation in the Povolžje.
Sverdlovskiĭ [Sverdlov] which is earlier and more productive than York was developed in the Urals. The variety is hardy and shows resistance to *Phytophthora*. The flavour of the tubers is compared with that of Rannjaja Roza [Early Rose]. The tubers remain white inside when cut and have a low solanin content.

1960. Lisjutina, N. I.
(Interspecific potato grafts).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 7 : 51–55. [Russian].

Changes in several varieties of *Solanum tuberosum* resulting from grafting with *S. demissum* scions were studied at the Stavropolj Agricultural Institute.
The changes in Smyslovskiĭ included a modified structure of the epidermal leaf cells, which remained constant in the first and second tuber generation and a higher percentage of dry substance in the leaves. The grafted hybrid had tubers which, like the tubers of the Smyslovskiĭ controls, contained no solanin. It is concluded that vegetative hybridization with *S. demissum* improves the hardiness of Smyslovskiĭ under Stavropolj conditions.

1961. Gurmaza, A. M.
(Plants grown from grafts between tubers of healthy potatoes and potatoes showing physiological degeneration).
Bot. Ž. (Bot. J.), Kiĭv 1949 : **6** : No. 4 : 53–58. [Ukrainian].

The healthy half of the tuber had a beneficial effect upon the half showing symptoms of a form of rugose mosaic not due to a virus but physiological in origin. The tubers produced by the diseased half of the grafted tubers were healthier and more productive than the controls.

1962. Hooker, W. J. and
Page, O. T.
Potato tuber growth and scab infection.
Phytopathology 1951 : **41** : 17–18. (Abst.).

Observations on tuber development in relation to scab infection showed that necrotic areas were localized in the region of cell elongation in the susceptible Cobbler variety, these coalesced to form a continuous ring after subsequent apical growth of the tuber. After exposure to inoculum, shallow scabs developed on the tubers of Ontario, a resistant potato; these were not associated with areas of tuber expansion.

1963. Stapp, C.
Die Bakterienringfäule der Kartoffel und ihre erneute Beachtung in Deutschland. **(Bacterial ring rot of potatoes and the renewed attention given to it in Germany).**
Z. PflKrankh. 1949 : **56** : 81–92.

A brief general description is given of *Corynebacterium sepedonicum* and its symptoms. Reference is made to the tests for resistance carried out in the USA (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 301).

1964.

New Penn potato looks good for chips.
Crops and Soils **1951** : **3** : No. 6 : p. 32.

Mention is made of a new late-blight resistant potato, 2XJ–1, developed at Pennsylvania State College. On the basis of US No. 1 grade of tubers, the variety has outyielded Russet Rural by 90 to 181 bushels per acre; it is especially suitable for crisp manufacture.

1965. Köhler, E.
Betrachtungen zum Resistenzproblem bei *Synchytrium.* (Mutmassliche Abwehr und Nichtabwehr toxischer Angriffe des Parasiten). [**Considerations on the resistance problem as regards *Synchytrium.* (Probable defensive and non-defensive reaction to toxic attack of the parasite)**].
Z. PflKrankh. **1948** : **55** : 10–16.

The problem of the observed differences in resistance or tolerance reaction of plants to parasitic infections is reviewed with special reference to the physiological interpretation of the observations of the author and of other investigators of potato wart disease (cf. *Plant Breeding Abstracts*, Vol. XIII, Abst. 782).

1966. Boyd, A. E. W.
Susceptibility of *Solanum curtilobum* to *Spongospora subterranea* (Wallr.) Johnson.
Nature, Lond. **1951** : **167** : p. 412.

The results of tests on lines from the Commonwealth Potato Collection at the Plant Pathology Laboratory, Corstorphine, Edinburgh, have led to the conclusion that, although immunity from powdery scab may exist within the species *S. curtilobum*, certain lines are susceptible, at least in the stolons and roots. *S. curtilobum* as such cannot therefore be claimed as immune from the disease, without reference to particular lines.

1967.

Dyrkningsforsøg med tidlige spisekartofler. 1945–1948. (**Cultivation trials with early table potatoes 1945-48**).
Tidsskr. Planteavl **1950** : **54** : 161–63.

In Danish trials at four experimental stations and on different soils the following five varieties were found to be immune to wart disease: Vera, Primula, Frühbote, Frühmölle and Di Vernon. Webb's Early, Goldperle, Tylstrup 13187 and Fedgården were classed as susceptible.

1968. Grütte, E.
Rhizoctonia solani K. als Schädling der Kartoffelknolle. (***Rh. solani* K. as a pest of the potato tuber**).
Z. PflKrankh. **1940** : **50** : 225–30.

In the course of this investigation, 12 varieties of potatoes were tested for resistance to *Rh. Solani*; and among the best varieties were Aal [Eel] and Ackersegen which have also been recorded as only slightly susceptible to scab.

1969. Larson, R. H. and
Derby, J. F.
Variation in virulence of potato virus Y isolates from different sources.
Phytopathology **1951** : **41** : p. 23. (Abst.).

Under greenhouse conditions 18 isolates of the potato virus Y produced symptoms of varying severity on commercially grown north American varieties and wild species of

Solanum from south and central America. No individuals were immune from all the virus Y isolates, but Placid, Cobbler, LaSoda, Kennebec, Russet Burbank, Pontiac, Sebago and Green Mountain were the most tolerant varieties.

1970. Black, W.
Potato breeding in relation to disease resistance.
Ann. Appl. Biol. 1951 : **38** : 306–07. (Abst.).

The inheritance of hypersensitivity to virus diseases and late blight and the use of this reaction in potato breeding at the Scottish Plant Breeding Station, Edinburgh, are described (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 1890 and Vol. XX, Abst. 1742). In the case of the hypersensitive reaction of *Solanum demissum* to the late blight fungus, five genes conditioning foliage resistance have been identified.

1971. Köhler, E.
Fortschritte beim Nachweis von Kartoffelvirosen mit der Testpflanzenmethode. (**Progress in the demonstration of potato viruses with the test plant method**).
Z. PflKrankh. 1949 : **56** : 369–74.

A description is given of the method whereby the presence of virus X, A or Y can be demonstrated by rubbing the expressed sap of the plant to be tested on to two leaves of a test plant. *Gomphrena globosa* has proved specific for virus X. *Chenopodium album* and a form of *Amaranthus retroflexus* are also suitable. For virus A certain races of *Solanum demissum* are suitable and for virus Y the best so far found is the American seedling **41956**. Trials were made with a number of hybrids of *S. demissum* with domestic potatoes in the hope of finding some suitable test plants. All seedlings resembled *S. demissum* in reaction to virus A; three of them reacted also to the three strains of virus Y used and to 8 strains of virus X and can thus be used as test plants in breeding for combined resistance to viruses A, Y and X. One hybrid, B 7, reacted only to virus A and may be a useful substitute for *S. demissum* in testing for A resistance; another hybrid reacted to A and X but not to Y.

1972. Lombard, P. M.
The effect of a mild strain of latent mosaic virus X on yield of some of the new potato varieties in Maine.
Amer. Potato J. 1950 : **27** : 445–49.

The reduction in yield of the varieties Chippewa, Sequoia, Sebago and Teton by latent infection with strains of virus X was determined by comparing commercial stock with (1) seed stock carrying a mild form of virus X and (2) virus free stock. Yields were lower in all commercial and mild-X stocks but the reduction only approached significance in Teton mild-X and Sebago commercial stocks, where the percentage reductions were 9·5 and 9·8, respectively.

1973. Stoker, G. L. and
Baird, G.
New potato varieties look promising.
Fm Home Sci. Utah 1950 : **11** : 38–39.

The varieties Bliss Triumph, DeSota, Kennebec, LaSoda, Progress and LaSalle were tested for their adaptation to the soil and climatic conditions of Utah, in the 1949 season. Progress, which is a red tuber variety, recently released in Nebraska, produced small plants with early maturity but yields were low. DeSota (Bliss Triumph x Katahdin) significantly outyielded the other five varieties, producing red tubers of medium early maturity. Although Kennebec was later maturing than the others, it was second in total yield. Trials are being continued.

1974.

25 Jahre Vereinigung Schweizerischer Versuchs- und Vermittlungsstellen für Saatkartoffeln (V.S.V.V.S.) und 14. Tätigkeitsbericht vom 1. Juli 1949 bis 30. Juni 1950. [**25 years—Association of Swiss Experimental and Distribution Centres for Seed Potatoes (V.S.V.V.S.) and 14th Report of work, from 1 July 1949 to 30 June 1950**]. Pp. 67.

The achievements of the 25 years since the foundation of the Association are reviewed. The list is given of the Swiss recommended selections, comprising 46 varieties of potatoes, those susceptible or resistant to wart disease being indicated. Erdgold [Earth Gold] and Allerfrüheste Gelbe [Earliest Yellow] keep better during storage than Bintje. Details are given of the trial in 1950, including large scale tests with new strains of Saskia, Olympia and Aquila, in 37 localities.

1975. Prijampoljskiĭ, P. K.
(Acclimatization of the sweet potato in southern Ukraine).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 7 : 75–76. [Russian].

Selection work with sweet potatoes is hampered by the incapacity of the available varieties to produce fruits with mature seed under Ukrainian conditions. Mention is made of 27 varieties developed at Suhum which have been given directed training under Odessa conditions. The aim is to obtain breeding material from locally reproduced seed. Some seed, including that of varieties 78 and Krasnyĭ Suhumskiĭ [Red Suhum], was obtained at Odessa by treating cuttings with manganese solutions of varying concentrations for 2–6 hours. The treatment intensified the development of the plants.

1976. Taylor, B.
Four new varieties.
Sweet Potato J. 1951 : **6** : p. 2.

The new sweet potato varieties Whitestar (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 1093), Allgold (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2416), L–241 and Georgia Bunch Puerto Rican are to be grown on a commercial scale. Developed at the Louisiana State University Agricultural Experiment Station, L–241 is superior to Unit 1 Puerto Rican in total yield, yield of US No. 1 roots and carotene content. It matures about two weeks earlier and is especially suitable for canning; it is resistant to wilt and moderately resistant to soil rot. Georgia Bunch Puerto Rican is regarded as the most suitable table variety for cultivation in Georgia. It originated from a bunch type found growing among runner plants by J. H. M. Cliett. The plants are only about 30 inches high at maturity: they are therefore easier to cultivate and harvest. The new form is earlier maturing and more uniform in root shape than the parent variety, and gives higher total yields and yields of US No. 1 roots.

1977. Calzada, B., J.
Variedades de camote que debe difundirse en la costa. **(Sweet potato varieties worthy of diffusion along the coast).**
Agronomía, Lima 1950 : **15** : No. 63 : 43–51.

Data are provided on the average yield and in some cases the vegetative period of some of the principal sweet potato varieties grown in the Peruvian coastal valleys.

FIBRES

1978.

Plains cotton gains favor with quality, adaptability.
Sth. Seedsman 1951 : **14** : No. 3 : p. 72.

The variety Plains, produced by the Alabama Experiment Station from the cross Stoneville 2B x Clevewilt back-crossed to Stoneville 2B, has shown a wide range of adaptability in

Alabama, Georgia, Florida and Mississippi. Wilt and nematode resistance has been inherited from Clevewilt, combined with the desirable spinning characteristics of the Stoneville 2B parent. Ease of picking, moderate storm resistance and medium large bolls averaging 65–70 per pound are additional advantages for harvesting.

1979. Boza B., T.
Sobre la eficiencia de los nuevos linajes de algodón Tangüis obtenidos en Perú y acerca de los métodos utilizados para producirlos. (**The efficiency of the new lines of Tangüis cotton obtained in Peru and the methods used in producing them**).
Lilloa, Tucumán 1949 : **18** : 155–64.

Since its discovery in 1916, Tangüis cotton has come to occupy 85% of the cotton area of Peru, largely owing to its combination of resistance to *Verticillium* wilt, high yield and good quality lint, which is exceptionally white, uniform and resistant, of the rough type, with a staple length of $1\frac{1}{4}''$ and above. Further selection, originally designed to prevent degeneration, has led to the production of a number of improved lines, the first of which was LM 7–35, superior to the original Tangüis in yield, earliness and uniformity of ripening, so that 80% of the yield is obtained in the first picking; it has a ginning percentage of 38·4–39·2 and staple length of $1\frac{6}{16}$–$1\frac{1}{2}''$ and its yield is 30% above the average. From this line, a further selection, LM 117–38, was obtained, similar in all characters but its longer and silkier lint, which reaches $1\frac{17}{32}''$. Line LMW 12–40 is the first variety fully resistant to *Verticillium* wilt and has admirable commercial characters, combining a staple length of $1\frac{11}{32}''$ with a ginning percentage of 42·7–43·9; it has given yields of up to 3183 kg. raw cotton and 1348·89 kg. lint per hectare and is considered the best cotton so far produced in Peru. Several of Harland's line mixtures have proved popular; one of them, SNA 242, a mixture of 38 lines, has the following characteristics: staple length $1\frac{7}{16}''$, boll weight 5·0 grm., lint percentage 40·7 grm., colour 3·3 (usual scale), and fineness, medium. Another, SNA 243, a mixture of five lines, has: lint length $1\frac{6\cdot5}{16}''$, boll weight 5·2 grm., lint percentage 40·0%, colour 3·2, and fineness 3·10.
An increase of 15% in the yield of cotton has been effected in Peru by the introduction of these improved varieties.

1980.
The opening of the cotton research station Namulonge, Uganda.
Emp. Cott. Gr. Rev. 1951 : **28** : 44–48.

The new station is described and illustrated (cf. Abst. 1185).

1981.
Empire Cotton Growing Corporation 1921 to 1950.
Emp. Cott. Gr. Rev. 1951 : **28** : 1–43.

A comprehensive historical survey of the cotton breeding and other activities of the Corporation is presented.

1982. Balasubrahmanyan, R.,
Santhanam, V. and
Mayandi Pillai, S.
Inheritance of three new characters in the 'Cocanadas' cotton.
Indian Cott. Gr. Rev. 1950 : **4** : 154–66.

Three new genes present in cotton obtained from the Godavari district have been investigated at Coimbatore; they are, R_2^{os} determining ghost spot, *lm* for immature lint and de_b controlling incomplete boll dehiscence. Data are presented from observations on F_1, back cross and F_2 generations for all three types, which bred true for seven generations. The three characters were found to be of a monogenic recessive nature, occurring independently.

The variability of multiple allelomorphs, some of which resemble those of *Gossypium sinense,* and the presence of a large number of genotypes not recorded in the Burma-Assam area are cited as evidence for the possible development of varieties of *G. arboreum* in the Cocanada tract.

1983. Loden, H. D.
Genetic evidence of cryptic cytological differences in *Gossypium hirsutum* (L) and *Gossypium barbadense* (L).
Genetics 1950 : **35** : p. 676. (Abst.).

The linkage between the loci R_1 for red plant colour and *cl* for cluster fruiting habit was studied in both interspecific and intraspecific back crosses of *G. hirsutum* and *G. barbadense.* The results from the intraspecific back crosses indicated approximately 16% crossing over, whereas those from the interspecific back crosses showed only 8%. Since in previous investigations complete homology for all the chromosomes has been found in the cross *G. hirsutum* x *G. barbadense,* the absence of cross over types in the expected numbers in the interspecific back crosses has been attributed to cryptic cytological differences. It is suggested that cryptic differences between chromosomes have been an important factor in cotton speciation.

1984. Brown, M. S. and
Menzel, M. Y.
New trispecies hybrids in cotton.
J. Hered. 1950 : **41** : 291–95.

The technique of crossing colchicine-induced hexaploids of the F_1 hybrid of *Gossypium hirsutum* and a diploid species, with another diploid species which cannot be crossed directly, is described. Cytological data for two new tetraploid triple hybrids (*G. hirsutum* x *G. herbaceum*) x *G. Harknessii* and (*G. hirsutum* x *G. arboreum*) x *G. Harknessii,* obtained in this manner at the Texas Agricultural Experiment Station, are summarized. The main difference between these two *G. Harknessii* hybrids is in the frequency of different multivalent types; these are predominantly trivalents in the *G. herbaceum* hybrid and quadrivalents in the *G. arboreum* hybrid. Chromosome pairing is compared between the two hybrids and with the (*G. arboreum* x *G. Thurberi*) x *G. hirsutum* trispecies hybrid. The two hybrids involving *G. Harknessii* are more similar to one another than to the *G. Thurberi* hybrid, which has a more complex pairing relationship. The D genome of *G. hirsutum* does not appear to be completely homologous with that of either *G. Thurberi* or *G. Harknessii*; these two species are equally acceptable as the putative wild American parents of *G. hirsutum.*
Four additional new triple hybrids, (*G. hirsutum* x *G. anomalum*) x *G. Harknessii,* (*G. hirsutum* x *G. Stocksii*) x *G. Armourianum,* (*G. hirsutum* x *G. Stocksii*) x *G. Harknessii* and (*G. hirsutum* x *G. Stocksii*) x *G. Raimondii* are reported.

1985. Boza B., T.
Informe sobre la producción algodonera en Colombia y recomendaciones para fomentar este cultivo en el país. (**Report on cotton production in Colombia and recommendations to promote its cultivation in that country**).
Medellín 1948 : Pp. 78. (Mimeographed).

In this report, an account is given of the selection work that has been done in Colombia on the improvement of local cotton populations. Special mention is made of the local type known as Híbrido Nativo de la Costa [Native Hybrid of the Coast], which is specially adapted to the Atlantic coastal zone; it is probably a form of *Gossypium hirsutum* var. *Marie-Galante.* Two improved selections of this type, lines 7 and 18, have been isolated. Another local type of interest is the Mono cotton (*G. barbadense*) of Santander.
Recommendations for future breeding and genetical work are listed.

1986. YAMADA, N.
[On pollen tube development in crosses between Asiatic and Upland cottons (preliminary report) II.].
Bot. and Zool. 1939 : **7** : 729–36. [Japanese].

In order to elucidate the reasons for retarded pollen tube growth in crosses of Asiatic and Upland cottons, studies were made of the osmotic pressure in the leaf cells of one Upland and two Japanese cottons, and of the percentage of burst pollen grains in 1·0, 1·5, 2·0 and 2·5 M sucrose solutions. The osmotic pressure of the leaf cells of the Japanese varieties was 2–3 atmospheres greater than those of the Upland cotton, and the critical concentration of sucrose preventing the bursting of pollen grains was also higher in the Japanese varieties. These differences in osmotic pressure are thought to explain some of the difficulties preventing fertilization between the two cotton types.

1987. DOUWES, H.
The cytological relationships of *Gossypium somalense* Gürke.
J. Genet. **1951 : 50** : 179–91.

The chromosome number of *G. somalense*, reported for the first time, was found to be $2n = 26$. Morphological and cytological studies were carried out on the hybrids *G. anomalum* x *G. somalense*, *G. anomalum* x *G. Stocksii* and *G. Stocksii* x *G. somalense*. In the first two hybrids, both completely sterile, chromosome pairing during pollen meiosis was low, with an average of 1·4 and 2·7 bivalents respectively. In the first anaphase the bivalents always formed bridges. The hybrid *G. Stocksii* x *G. somalense*, however, showed a very high degree of homology between the two parental chromosome sets; pairing was almost complete. Thus the homology between the B set of chromosomes of *G. anomalum* on the one hand and the E_1 set of *G. Stocksii* and E_2 set of *G. somalense* on the other is very low. The cytological relationships between the three species are discussed in connexion with their classification according to morphological characters and with their geographical distribution.

1988. HUTUKAITI [HUTSUKAITI], S.
(On the artificial germination of cotton pollen using a new medium for germination).
Jap. J. Genet. **1942 : 18** : 115–16. [Japanese].

The substance of this paper has been already summarized in Abst. 440.

1989. BALASUBRAHMANYAM, R. and SANTHANAM, V.
Inheritance of 'crinkled leaf'—a new abnormal mutant in Asiatic cotton.
Curr. Sci. **1951 : 20** : p. 46.

A new mutant character, crinkled leaf, occurring in *Gossypium arboreum* is described; it depends upon a single recessive gene pair designated *cracra*.

1990. ARUTJUNOVA, L. G.
(Intravarietal cross pollination of cotton).
Agrobiologija (Agrobiology) 1950 : No. 5 : 19–24. [Russian].

Mičurinite studies of the floral biology of cottons at the Central Breeding Station of the USSR Scientific Research Institute for Cotton are reported. The material included selfed lines and hybrids derived from varieties 36 M 2, S–460, 1306, Krasnolistnyĭ Akala [Red Leaf Acala], 8517 and 2 IZ.
The experiments suggest that the reproductive organs of the flowers in a central position on the plants are more vigorous than those on the lower or upper branches of the same plants. The pollen grains from these flowers are larger and more viable, and the pollen

tubes grow more extensively and result in better seed setting. The pollen tubes of cross-pollinated flowers develop better than those of selfed flowers.
The seed obtained from the central flowers gives more vigorous and productive plants than that collected from other positions on the plant. These plants have shorter internodes and are early and develop uniformly. Changes in the selective capacity of variety S–460 according to the time of pollination are reported. Pollination with a pollen mixture comprising self pollen and the pollen of two other varieties gave a higher percentage of hybrid progeny when the operation was made soon after the flower opened than when it was delayed for a day.
There has been some evidence that mixed pollen intensifies the growth of the pollen tubes and results in more successful fertilizations and better embryo development than self pollen. This is explained by the biological inferiority of self pollen and by larger amounts of pollen and better distribution of the pollen over the more vital positions of the stigma in cross pollinations.
It was found that moisture conditions affected fertilization processes, a curtailment in water supply resulting in the production of a smaller number of seeds in the boll and in the seed having inferior properties.
Experiments with variety 8517 suggest that intervarietal hybrids derived from the same parents but differing in respect of their origins make better crosses than material of identical origin.

1991. Mikailov, M. A.
(Intravarietal hybridization of cotton).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 7 : 42–44. [Russian].

In experiments conducted at Kirovabad in 1938 and 1939 intravarietal pollination of the cotton varieties 486/8, 01 and the Upland cotton variety 0700 gave good results. The beneficial effect of hybridization was most marked when varieties of different origins were used in the crosses.
As a result of intravarietal hybridization all three varieties developed a greater number of bolls per plant, contained more seed per boll, had longer lint and gave a higher lint yield. Natural cross pollination gave better results than hybridization of emasculated plants.

1992. Ter-Avanesjan, D. V. and
Gurevič, L. I.
(New data on the inheritance of characters of two male parent forms in cotton).
Agrobiologija (Agrobiology) 1950 : No. 5 : 13–18. [Russian].

Previous investigations of the inheritance in cotton progenies from multiparental crosses (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 396) have been continued, the most recent results suggesting that the growing embryo assimilates substances supplied by the pollen tubes during the process of fertilization.
In the present experiments the material comprised *Gossypium hirsutum* varieties. The female variety, 18819, had the recessive characters of green palmatifid leaves and white lint colour. It was pollinated with 10 pollen grains of a red leaved white linted variety 1677 and four hours later with larger amounts of pollen of the variety S–4006. This variety had a palmatisect leaf and brown lint.
The F_1 from the cross segregated four hybrid types, two of which showed the characters of both male varieties in respect of leaf shape and colour and cotton colour. The progenies of all four types were selfed. As a result of selfing of the types possessing the characters of both male varieties, 627 plants were obtained in the F_2. Of these 549 were normal hybrids between the initial female variety and one or the other male parent, while 78 hybrids showed characters of both male varieties participating in the original cross. It was remarkable that the F_2 from the hybrids of the type 18819 x 16772 in the F_1 included 27 plants which had characters of both the male parents.

Three distinct types of hybrids with the characters of both male varieties are described. Their individual selection in the F_2 gave uniform families in the F_3.
Similar changes in morphological and economic characters were obtained in experiments with the green leaved variety 108 F which was pollinated with two grains of self pollen and with large amounts of pollen of the red leaved variety four hours later.

1993. Balasubrahmanyan, R. and
Santhanam, V.
Inheritance of 'pistillate' in cotton.
Curr. Sci. **1951 : 20** : p. 17.

The mutant pistillate of *Gossypium arboreum* is a male sterile type characterized by staminode structures, a branched stigma and a fluted ovary; when pollinated by foreign pollen it sets normal bolls. The mutant has been found to depend upon a single recessive gene, designated *pte*.

1994. Emge, R. G.
Occurrence of abnormal cotton bolls in Arkansas.
Phytopathology **1951 : 41** : p. 11. (Abst.).

It is believed that abnormal cotton bolls, which have been studied at the Fayetteville station, may be genetically controlled, although climatic factors appear to affect their development in several varieties. The abnormal condition is caused by additional carpels forming within the original boll; as these develop the boll splits and pathogenic organisms enter.

1995. Isaac, S. A. (Jun.) and
Henderson, M. T.
Inheritance of leaf pubescence in Upland cotton.
Agron. J. **1951 : 43** : p. 99.

At the Louisiana Agricultural Experiment Station, the inheritance of degree of leaf pubescence was investigated in the F_2 of a cross between Delta Smooth Leaf, which has almost smooth leaves, and Stoneville 2–B, an upland variety with the normal degree of hairiness. A ratio of 158 pubescent : 64 smooth was obtained from 222 F_2 plants. It was concluded that the absence of pubescence is differentiated from the normal pubescent condition by a single factor pair in which pubescence is dominant. By dividing the parent and F_2 plants into seven classes, differentiated on the basis of degree of pubescence, it was however found that most of the smooth plants had a higher degree of pubescence than their smooth leaved parent; this was accounted for by the assumption that although the smooth character may appear to be simple in inheritance, it is a quantitative character governed by multiple factors. Correlation coefficients for the degree of pubescence and six quantitative characters of the fibre and seed are given; they show that the non-pubescent condition in the variety Delta Smooth Leaf is independent of other characters of economic importance.

1996.
Indian Central Cotton Committee. Annual Report of the Director Technological Laboratory for the year ending 31st May 1949 : Pp. 86.

Reports of fibre and spinning tests on (1) cotton breeding material and samples from variety trials, (2) trade varieties of Indian cotton and (3) standard Indian cottons of the 1947–48 season are presented. The section on technological research includes investigations on methods of testing cottons in breeding work, such as the use of the polarized light technique in estimating fibre maturity, comparison of different methods of measuring halo length and the development of an improved gin suitable for small samples.

1997. Hutukaiti [Hutsukaiti], S.
(On tetraploid Asiatic cotton and its characteristics).
Bot. and Zool. 1940 : **8** : 597–601. [Japanese].

Tetraploid plants of *Gossypium arboreum* were obtained by colchicine treatment. Though fertility was low initially, seed was obtained later by selfing and crossing with *G. hirsutum*. The seeds of the tetraploids were heavier than those of the diploids, being equivalent in weight to the seed of upland cotton. The length, width and strength of the fibre of the tetraploids was greater than in the diploids, but the number of kinks per unit length was less.

1998. Boza B., T.
Nota sobre las especies del género "*Gossypium*" cultivadas en Colombia.
(A note on the species of *Gossypium* cultivated in Colombia).
Lilloa, Tucumán 1949 : **18** : 133–41.

Cottons of the section *Hirsuta* of the American group, all with $n = 26$, occur both wild and cultivated in Colombia, the predominant types being *G. hirsutum* var. *Marie-Galante* and var. *punctatum* and *G. barbadense*. Indications are given of the distribution of the main types. Some of them are of distinct interest for breeding purposes and are described. One for instance, a form of *G. hirsutum* var. *Marie-Galante* known as Híbrido Nativo de la Costa [Native Hybrid of the Coast], is characterized by extreme tolerance of unfavourable conditions, lint percentage of 31–32, weight of fibre per boll 2·5–2·7 grm., lint index 2·5 grm. and staple length 26–30 mm. Another form of the same hybrid has a staple length of 34·9 mm. and up to 9 seeds per locule.

1999. Ballard, W. W.
Varietal differences in susceptibility to thrips injury in upland cotton.
Agron. J. 1951 : **43** : 37–44.

Evaluation of thrips damage to young cotton plants by grading plants according to visible injury provides a rapid and accurate method of detecting varietal differences in susceptibility. Possibly this method would also be useful in breeding for thrips resistance. Highly significant varietal differences in reaction to thrips were observed in tests carried out in Georgia. Empire, Collins Stoneville, Coker 100 and Coker 100 Wilt exhibited a consistently high degree of resistance. In some varieties dense pubescence of the young terminal leaves appeared to be associated with thrips resistance. Other cottons however had an intermediate density of pubescence but differed widely in susceptibility; resistance may therefore be associated with other morphological or chemical factors not yet determined. Further research is required to discover whether dense pubescence of young leaves is associated with excessive hairiness of mature leaves, particularly in view of the increasing use of new smooth leaved varieties to facilitate mechanical picking and clearing.

2000. Masima, I.
Studies on the tetraploid flax induced by colchicine.
Cytologia, Tokyo 1942 : **12** : 460–68.

By treatment with 0·08% colchicine solution for 20 hours at 25° C., tetraploids were induced in 2–5% of the treated seeds of *Linum usitatissimum*, *L. angustifolium* and *L. crepitans*; characteristic gigas features in progeny in respect of size of pollen grains, flowers, capsules and seeds are reported. Retardation of growth in comparison with diploids was observed. Although the mean fertility of pollen grains was 60–70%, the number of seed set was much less owing to a tendency for flowers to fall soon after pollination. Chromosome behaviour in mitotic and meiotic divisions was examined; lagging chromosomes were frequently observed at anaphase.

2001. Rüdiger, W.
Morphologisch-anatomische Untersuchungen am Kelch des Leins *Linum usitatissimum* L. (**Morphological and anatomical investigations on the calyx of flax, *L. usitatissimum* L.**).
Züchter 1951 : **21** : 39–41.

Measurements were made of the sepals in flaxes of various geographical origins, the presence or absence of anthocyanin being also noted. Many varieties were also classified to show whether or not they exhibited light coloured spots on the sepals and the results were compared with the relevant data in the former German National Variety Register.

2002. Nishiyama, I.
(**Studies on artificially produced polyploid plants. III. Meiosis in tetraploid hemp**).
Bot. and Zool. 1940 : **8** : 47–52. [Japanese].

Tetraploid hemp plants have been produced by colchicine treatment and by decapitation. Meiosis in these plants is regular and fertility good. There is however some quadrivalent formation among the autosomes, and in the tetraploid males, the X and Y chromosomes usually form XX and YY bivalents rather than XY pairs.

2003. Cygulev, V. I.
(**Cultivating the southern type hemp without spatial isolation**).
Agrobiologija (Agrobiology) 1950 : No. 5 : 25–35. [Russian].

Russian experiments with several varieties of the southern type of hemp showed that cross pollination resulted in improvement of some of their economic properties without appreciably changing the maternal type of inheritance. In Mozdokskaja [Mozdok] the morphological changes amounted to 4·2% after two years of cultivation with other varieties without spatial isolation and in Južnaja Krasnodarskaja [Southern Krasnodar] to 6·5%, in Kavkazskaja [Caucasian] to 6·0% and Ferralonija to 8% after mixed cultivation for four years. Južnaja Krasnodarskaja when grown without isolation from other varieties showed increased productiveness. This was the case even when the variety was grown together with Mozdokskaja, which has a low stem and fibre yield and light seed.
Mozdokskaja yielded more seed when grown without isolation from other varieties.
Cross pollination of most varieties with Kavkazskaja resulted in increased yields of stems and fibre but a slight decrease in seed yields. The decrease in seed yield was more significant in the first year than in later years.
The effect of cross pollination upon Ferralonija, which is a productive tall variety but yields little seed, was to increase its seed productiveness, to decrease its stem and fibre yield and to shorten its growth period.

2004. Nishiyama, I.
Studies on artificial polyploid plants, V. The breeding of long-fibred varieties by doubling the chromosome number in hemp.
From Heredity 1950 : **4** : p. 398.

Data are provided on the germinability, habit, sex ratio and seed and fibre characteristics of the C_2 and C_3 generations of colchicine induced tetraploid hemp. In general the technological properties of the tetraploids were superior and the proportion of female plants was markedly increased. Meiosis in the tetraploids, involving minor aberrations, is described.

2005. Kapralova, N. P.
(**Our own varieties of jute**).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 6 : 42–45. [Russian].

The first varieties of jute, *Corchorus capsularis* and *C. olitorius*, developed in the USSR were 0311, 345 and 0420, bred at the Central Asiatic Research Station of the USSR

Institute of Plant Industry. More recently varieties 028, 264 and 065 have been selected at the Uzbekistan Research Station of the Institute for Fibre Plants. The last three varieties yield 10 to 15 centners fibre per ha. under Uzbekistan conditions.
The results of agrobiological studies of jute at the Uzbekistan Research Station of the Institute for Fibre Plants are reported.
The development of the plants was hastened by 32 to 33 days when the natural day was curtailed to 10 to 12 hours. Simultaneously the habit of the plants changed and they became stunted. Seasonal differences in the development of jute varieties planted on the same dates are pointed out.
Some varieties of *C. olitorius* such as 0420, 0421 and 345 give a wide range of variations within each variety in respect of time of maturity and growth habit when planted early, i.e. at the end of March. Their range extends from very early to late maturing and from prostrate to tall upright forms. The varieties 028, 064 and 065 are adapted to early planting and give uniform plant material.
Trials have shown that low temperatures in April have the effect of hastening the development of both groups of varieties with the result that the biological differences between them become less apparent.

2006.
Progress of research schemes.
Jute Bull. 1950 : **13** : 365–68.

The following work is briefly reported. Bulk and single plant seed has been collected; seed has also been secured from crosses. Colchicine treated plants of *Corchorus capsularis* and *C. olitorius* showing gigas characters were selected for further investigation. Root growth studies have revealed that the root systems of the two species are different. Analysis of varieties with regard to the rate of growth and fibre output at different stages was continued.

2007. Valjko, N. and
Antykov, A.
(Pressing tasks in Soviet kenaf growing).
Socialističeskoe Seljskoe Hozjaĭstvo (Socialistic Agriculture) 1950 : No. **10** : **42–50.** [Russian].

Recently developed Soviet varieties of *Hibiscus cannabinus*, noted for productiveness, early maturity and other good economic properties, include 021, 3233, 472, 5136, 0187 and 3876.

SUGAR PLANTS

2008.
Fifty years of scientific progress.
Bur. Sug. Exp. Sta., Brisbane 1950 : Pp. 92.

The year 1950 marks the fiftieth anniversary of the foundation of the Bureau of Sugar Experiment Stations in Queensland. The introduction of sugar cane to Australia during the last century and the subsequent developments are recorded in a general historical survey by N. J. King. Among the separate sections are those contributed by C. G. Hughes and J. H. Buzacott, which trace the development of disease resistance, and other aspects of breeding.

2009. King, N. J.
Fiftieth Annual Report of the Bureau of Sugar Experiment Stations and Report of the Director.
Queensland 1950 : Pp. 53.

Reports from the experiment stations refer to the varietal trials which have continued for frost and disease resistance, higher yields and adaptation to locality. Several infrequently

flowering varieties, including Loether's, SJ 16, Clark's Seedling, B 208 and Oramboo produced arrows; where possible, these were used in a number of crosses. Particular attention was paid to crosses involving early maturing varieties (cf. Abst. 1206). Several early maturing Co. 270 x POJ 2878 seedlings were used in crosses with varieties which are incompatible with Co. 270 itself, to produce progeny inheriting Co. 270 characteristics. Purely noble crosses and further nobilizations of hybrids derived from wild species were carried out (cf. Abst. 2014). The seedlings of the previous year included I 210 and I 208 from HQ 426 x C 278 and four sibs from Co. 270 x POJ 2878, which were selected as breeding canes; these also have commercial possibilities.

2010. Dodds, H. H.
New cane varieties in Queensland. Breeding programmes described.
S. Afr. Sug. J. 1951 : **35** : 47–49.

Varieties produced in Queensland during the past 15 years are briefly reviewed. It is mentioned that the present objectives in cane breeding are the production of varieties which are (1) early maturing, (2) heavy yielding but not liable to lodge, (3) resistant to red rot, leaf scald and chlorotic streak, and (4) able to stand over for another season. Other requirements include varieties to replace those being grown at present, if necessary, and special purpose canes for areas which may be subject to flooding or frost damage.

2011. Brett, P. G. C.
Investigations on sugarcane breeding in Natal during 1949.
Proc. 24th Annu. Congr. S. Afr. Sug. Technol. Ass. 1950 : 99–105.

Crosses made during 1949 are listed. These include several between Javanese Glagah and plants derived from other *S. spontaneum* forms, such as Co. 205 and Amu Darya x N : Co. 310. The largest number of seedlings came from Co. 421 x Co. 331 crosses, from which the newly released N : Co. varieties also originated, and from N : Co. 79 x Co. 301. Derivatives from *S. sinense* were also used.
Nearly two-thirds of the total seedlings were from crosses in which the fertility of the male parents was increased by application of temperatures of 48–53° F. Fertile pollen was obtained by this method from Co. 421, formerly considered male sterile at the Coimbatore Station, and flowering was induced in varieties such as Co. 290; these can rarely be used for breeding in Natal under natural temperatures which lie below the minimum for floral development. A review of experiments on the factors controlling sexual reproduction shows that, in Natal, low temperature limits the fertility of pollen and also the production of inflorescences, which are often initiated but seldom develop. Severe drought may cause reversion to vegetative growth at apices already bearing reproductive primordia.

2012.
Twentieth Annual Report of the Sugarcane Research Station, Department of Agriculture, Colony of Mauritius 1949 (1950) : Pp. 56.

The growth capacity and drought resisting powers of M 134/32, the variety constituting over 90% of the total cane area in 1949, are responsible for a record yield; the variety is being used for further breeding in attempts to produce seedling canes which will grow well on the poor, leached soils of upland areas. The progeny of M 134/32 includes two promising individuals, M 423/41 and M 213/40, which have produced yields higher than those of their parent. More seedlings have been obtained by crossing POJ 2878 x D 109, from which M 134/32 originated. Cross pollination work involved a wide range of parent varieties of the *Saccharum spontaneum* type and several crosses between *Saccharum* species. Of the Barbados varieties, only B 3439, B 34104 and B 37172 have produced promising progeny. New cane varieties have been imported from South Africa and USA. Large scale varietal trials of first and second year seedlings are in progress in addition to

other cultural trials. The resistance of M 213/40 and M 423/41 to the root eating grubs of *Clemora smithi* is being compared with that of M 134/32.
Field trials of oats, sorghum, rice, linseed, sweet potato and groundnut were also undertaken.

2013. GARD, K. R.
Sugar cane breeding in Queensland. Twenty-five years experience at Macknade.
S. Afr. Sug. J. 1951 : **35** : 37–45.

The history of breeding work in Queensland is surveyed. Recent trends illustrate the successful use of parents derived from wild *Saccharum spontaneum* strains; the F_3 generation from a cross with a wild strain appears to combine the optimum proportions of wild and cultivated characters necessary to constitute a satisfactory parent from which desirable commercial varieties can be obtained.
The advantages of pure line breeding of parental material, followed by hybridization between such pure lines, are discussed in respect of attempts to produce early maturing varieties which are cold resistant. It is hoped that individuals homozygous for high sucrose content and ratooning vigour may be developed.

2014. BUZACOTT, J. H.
Varietal changes in the Cairns district 1933-49.
Cane Gr. Quart. Bull. 1950 : **14** : 60–65.

It is expected that hybrid sugar cane varieties will be used for replanting the areas supplying the Hambledon and Mulgrave mills, Queensland. Early maturity is being sought from certain noble canes hybridized with *Saccharum spontaneum*, *S. sinense* and *S. robustum* or other so-called "wild" species.

2015. MORIYA, A.
Contributions to the cytology of genus *Saccharum*. II. The chromosome number of *Saccharum robustum*, indigenous to New Guinea.
Cytologia, Tokyo 1944 : **13** : 265–69.

Cytological observations have shown that the chromosome number of variety 25 NG 251 of *S. robustum* is $2n = 80$; there are no irregularities in meiotic division.

2016. MORIYA, A.
Contributions to the cytology of the genus *Saccharum*. IV. Studies of chromosomes in wild *Saccharum* species in Formosa.
Cytologia, Tokyo 1950 : **15** : 237–54.

Various forms of *S. spontaneum* collected in widely scattered localities of Formosa are divided into two types: (1) those smaller than 2 m. in height assigned to *S. spontaneum* subsp. *indicum* var. *genuinum*, in which $2n = 112$; and (2) plants larger than 2 m. in height belonging to *S. spontaneum* subsp. *indicum* var. *Roxburghii*, in which $2n = 96$. Although the variety Glagah from Java also has the chromosome number $2n = 112$ it is thought to be phylogenetically distinct from *S. spontaneum* subsp. *indicum* var. *genuinum*. Chromosome numbers in relation to distribution are recorded for *S. spontaneum* types in India.

2017. BEAUCHAMP, C. E.
A new method of increasing the sugar content of sugar cane.
Proc. 23 Annu. Conf. Asoc. Tecn. Azucareros Cuba 1949 : 55–87.

The results obtained from experiments, at different localities in Cuba, in which hormones were applied to commercial varieties of sugar cane to increase the sugar content, are

reported. Varieties POJ 2878 and Media Luna 3–18 responded to treatment, the increase being about 1 arroba per 100 arrobas of cane.

2018.

3,010 crosses made during year.
Rep. 69 Annu. Mtg Hawaii Sug. Exp. Sta. 1949 : 30–32.

A large number of sugar cane crosses were made by the Hawaiian Genetics Department, in the 1948–9 season, by the "melting pot" method in which the female parent alone is known. Pollen from many varieties is used to produce progeny of diverse combinations. Those which show promise for breeding work under this method are tested further in "bi-parental" crosses, in which both parents are known.

2019.

Tests underway to delay tasseling in early tasselers.
Rep. 69 Annu. Mtg. Hawaii Sug. Exp. Sta. 1949 : p. 32.

The Hawaiian Department of Genetics has confirmed the discovery of Takeshita, in 1939, that tasseling may be delayed in early tasseling varieties by removing the leaf spindle shortly before flower bud initiation; thus it is possible to cross early with medium and late tasseling varieties.
Investigations are being made to ascertain the use of lighting at night to delay tasseling and the causes of variability in tassel germination.

2020. Bliss, L. R.
Refractory juices from the agricultural standpoint.
Proc. 23 Annu. Conf. Asoc. Tecn. Azucareros Cuba 1949 : 33–54.

Varietal differences in the inorganic composition of cane sugar juice and the possibility of regarding colloidal content, which affects juice clarification, as a varietal function are discussed. Investigations appear to indicate that the quantity and type of colloids are generally determined by soil character and climatic conditions, modified by the degree of maturity of the cane and its percentage of leaves, unripe joints and adhering soil on reaching the mill; exceptions, in which the presence of a refractory colloid is attributed to varietal influence, are recorded.

2021. Cabrera, M. R.
The consensus on the agricultural and industrial characteristics of commercial sugar cane varieties in Cuba.
Proc. 23 Annu. Conf. Asoc. Tecn. Azucareros Cuba 1949 : 129–39.

All 38 varieties of sugar cane which have been grown successfully in Cuba are analysed for the following characters with respect to breeding: stooling powers; cutting quality; number of crops obtained; removal of leaves; fibre and sucrose content; defecation; resistance to mosaic disease, fire and drought; date of ripening; acceptability as cattle fodder; germinating capacity; ratooning quality; vigour; yielding ability; and adaptation to different kinds of soil.

2022. Chu, T. L.
A study on the technique of field experimentation with sugar cane. I. Suitable size and shape of plot and number of replications.
Rep. Taiwan Sug. Exp. Sta. 1949 : No. 5 : 77–90.

Uniformity trials with sugar cane in Taiwan have shown that plot size should not fall below 15/2000 ha., that the ratio of length to breadth of the plots should be between 5 : 1 and 10 : 1 inclusive, and that there should not be less than 5 replications.

2023. GRASSL, C. O.
Importation of sugarcane breeding material into the United States.
Sug. Bull. N.O. 1951 : **29** : 101–07.

Cane varieties imported into the US are listed, and brief accounts are given of the breeding possibilities of different groups, mentioning the time saved in the US breeding programme by importing many valuable selections.

2024. VALLANCE, L. G.
Recent advances in sugar-cane culture in Queensland.
Emp. J. Exp. Agric. 1951 : **19** : 13–25.

A section reviewing work on sugar cane introduction and breeding in Queensland is included.

2025. STEVENSON, G. C.
Report on a visit to British Guiana.
Bull. B.W.I. Cent. Sug. Cane Breed. Sta. 1951 : No. **34** : Pp. 7. (Mimeographed).

The performance of sugar cane varieties bred in Barbados and of locally developed canes in British Guiana is surveyed. The reaction of varieties to leaf scald, a disease of widespread occurrence in 1950, particularly on B 34101, is also discussed. Certain varieties developed in Mauritius possess satisfactory resistance to leaf scald. Some of these varieties are available at the present time in British Guiana; testing their reaction to the disease is therefore recommended. In Barbados over a hundred varieties are to be studied for resistance to leaf scald.

2026. BRANDES, E. W.
A sugarcane disease complex in Oriente.
Proc. 23 Annu. Conf. Asoc. Tecn. Azucareros Cuba 1949 : 9–16.

Investigations were carried out at Beltsville, Md, to determine the nature of a new disease of sugar cane in Oriente. Within three days after inoculation with isolates from severely infected specimens typical symptoms of *Ceratostomella paradoxa* infection developed. The progress of infection was more accelerated in POJ 2878 than in Media Luna 3–18, and was intermediate in Cristalina.

2027. ABBOTT, E. V.
The brown spot leaf disease of sugarcane in Louisiana.
Sug. Bull. N.O. 1951 : **29** : 134, 139.

The most effective means of controlling brown spot leaf disease (*Cercospora longipes*) is the use of resistant varieties. Fortunately only one of the present commercial varieties in Louisiana, CP 36/105, is highly susceptible to the disease. It is anticipated that the resistant cane CP 44/101 will eventually replace CP 36/105 to a considerable extent. CP 43/47, a moderately susceptible variety, may also be planted on some of the acreage devoted to CP 36/105. Most of the parent varieties used in breeding at the Canal Point station are resistant to brown spot; the susceptibility of CP 36/105 was derived from its female parent Co. 281.

2028.
Hawaiian varieties shown susceptible to Fiji disease.
Rep. 69 Annu. Mtg Hawaii Sug. Exp. Sta. 1949 : p. 16.

All the sugar cane varieties grown commercially in Hawaii have shown susceptibility to Fiji disease in tests at the Samoan substation. The reactions of the ten most important varieties are listed; 37–1933 was resistant to the disease for two years, while subjected to conditions under which other varieties rapidly became infected. Work is now in progress

to ascertain whether such differences can be correlated with the preference of leafhoppers for particular varieties, the efficiency of certain leafhoppers in transmitting the disease, or the existence of more than one virus strain.

2029.

Commercial canes show resistance to mosaic.
Rep. 69 Annu. Mtg Hawaii Sug. Exp. Sta. 1949 : p. 17.

New and established commercial varieties of sugar cane grown in Hawaii have shown resistance to mosaic disease in tests at the Hawaiian experiment station.

2030.

Forecast of approved varieties for 1951.
Cane Gr. Quart Bull. 1950 : **14** : p. 88.

The Bureau of Sugar Experiment Stations, Queensland, has prepared a list of varieties which will form the basis of the approved variety list of 1951. The varieties Pindar, Q 50 and Q 55 are recommended additions for many cane growing regions.

2031.

Review of seedling performance during 1949.
Rep. 69 Annu. Mtg Hawaii Sug. Exp. Sta. 1949 : 28–30.

High yielding varieties have been tested at field stations in the Hawaiian islands; those best suited to each locality have been chosen. A diagrammatic representation of the origin of 37–1933 is given, showing its descent from varieties with desirable characteristics. This variety has outyielded all others on the fertile, irrigated leeward areas and the better irrigated land in the windward districts. The varieties 32–8560, 38–2915, 39–3633, 39–4753, 39–7028 and 41–3340 have shown promise in certain areas; 44–3098 is the most adaptable of the new seedlings, growing strongly in all regions, but it has not yet equalled the yields of 37–1933.

2032. Schlösser, L. A.
Über plasmatische Vererbung auf polyploiden Stufen. **(On plasmatic inheritance at different grades of polyploidy).**
Planta 1949 : **37** : 535–64.

The inheritance of root weight and sugar content was analysed in reciprocal crosses involving diploid and tetraploid strains of Kleinwanzleben E sugar beet and Peragis rote Walze [Peragis Red Tankard] fodder beet. Using a for the genome of the sugar beet, b for the genome of the fodder beet, α and β for the respective diploid plasmons, and α' and β' for the respective tetraploid plasmons, plants of the following constitutions were obtained: abα, abβ, aabbα', aabbβ', aabα', aabβ, abbα, and abbβ'.
Differences in the sugar percentage of the reciprocals abα and abβ were hardly significant, but aabbα' had a much higher sugar content than the reciprocal aabbβ'. Similarly in the triploids, aabα' had a higher content than its reciprocal aabβ, and abbα than its reciprocal abbβ'.
To explain the differences in the polyploid reciprocals but not in the diploids, it is suggested that polyploidy modifies the properties of the plasmon and that the degree of modification is not the same in the two types studied.

2033. Negovskiĭ, N. A. and
Titova, N. F.
(Inducing changes in sugar beet by grafting).
Agrobiologija (Agrobiology) 1950 : No. 5 : 104–07. [Russian].

Vegetative hybridization experiments with sugar beet at the USSR Scientific Research Institute for Sugar Beet in Kiev are reported. The object is to obtain productive sugar

beet with high sugar content. The grafting technique was varied except that in all grafts the scion was always phasically younger than the stock. Most of the material comprised plants passing through their second and third leaf pair phase. The material used as stocks was obtained from vernalized seed and was given additional illumination after the appearance of the shoots. This was done to promote its more rapid phasic development. The evidence showed that the productive scion varieties VI–591, I–1305 and F_1 hybrids from the cross between sugar beet and forage beet accumulated appreciably more solids when they were grafted on stocks of varieties M6 and V–1612, remarkable for high sugar contents. On the other hand the sugar content of M6 and V–1612 decreased when they were grafted as scions on the stocks of productive varieties with lower sugar contents.
The choice of components for the grafts also determined the weights of roots and leaves. For instance, the weight of the root of VI–591 on VI–591 was 304 grm., the root of VI–591 on V–1612 weighed 259 grm., and of VI–591 on M6 only 180 grm.
It is expected that the changes induced by grafting can be made more thorough by training the hybrid material obtained from seed upon mentors.
Reference is made to grafted hybrids between chard and table beet and between chard and sugar beet. The latter grafts showed remarkable changes in leaf character.

2034. Decoux, L.
Comment accroître la qualité de la betterave sucrière? (**How shall the quality of sugar beet be raised**?)
Publ. Inst. Belge Amélior. Better. **1951** : **19** : 1–18.

The problem of how to raise the sugar content of sugar beets in Belgium without reducing the production by weight is examined from the standpoints of manuring, the proper choice of varieties and early sowing.
The grower should avoid all varieties of the EE type.
Varieties of the E type benefit most from a long growing period, while those of the N type attain their maximum sugar content more rapidly and should be used for normal or late sowing and early lifting.

2035. Wauthy, R. and
Roussel, N.
Étude de la résistance à la montée en graines des variétés de betterave sucrière utilisées en Belgique. (**A study of the resistance to bolting of the varieties of sugar beet used in Belgium**).
Publ. Inst. Belge Amélior. Better. **1950** : **18** : 191–96.

For various reasons it is becoming customary to sow sugar beets earlier, and seed firms are selecting for increased resistance to bolting without any reduction in sugar content or yield of roots and tops.
Brief reports of the bolting trials carried out in 1950 and 1946–50 by the Belgian Institute for Beet Improvement confirmed that, in general, varieties of the E type are more resistant to bolting and better suited to early sowing than the N type of varieties.

2036. Cours, G.
Le manioc à Madagascar. (**Manioc in Madagascar**).
Bull. Agric., Madagascar **1950** : **3** : No. 24 : **3–12**.

This paper, embodying the conclusions of the author's thesis for a doctorate, deals with manioc production from the following aspects: (1) nomenclature and a suggested classification of clones, based on more or less natural groupings according to stigma colour, length or absence of petioles, and the presence of a sterile andrecium; (2) fluctuating characters; (3) defects of existing varieties; (4) evaluation of varieties and the ideal type; and (5) the breeding of new varieties and results attained to date.
Some selections are described: H 36, derived from a cross of Java with São Pedro x Australia, and H 31, raised from seed from Singapore, are both recommended for rich soils; H 32 from a Java x Singapore cross often produces plants bearing 30 kg. of roots;

and H 38 is the most resistant to various forms of rot. Descriptions are also given of some of the varieties used as breeding material, e.g. Criolina, Bouquet, São Pedro, Nagasoga and Java 12/28.
Madagascar has at least 300 varieties of manioc and, as part of the systematic study of manioc, a collection has been established at the Alaotra Agricultural Station of the different clones planted on the island and of a large number of the known varieties from Africa, Asia and Oceania.

2037. Pacheco, J. A. de C.
Observações preliminares sôbre a influência da variedade de mandioca na viscosidade do polvilho. (**Preliminary observations on the influence of the variety of cassava on the viscosity of the starch**).
Rev. Agric., S. Paulo 1950 : **25** : 337–66.

Significant differences in starch viscosity were obtained when a series of Brazilian cassava varieties were compared, using first an Engler viscosimeter and secondly a Brabender amylograph.

STIMULANTS

2038. Smith, H. H.
Fixing transgressive vigor in *Nicotiana rustica*.
Genetics 1950 : **35** : p. 692. (Abst.).

A transgressive inbred selection of *N. rustica*, derived from an intervarietal hybrid, was obtained. Data from the F_2 and first back cross were analysed for heritability. Heritability of plant height was 55% and selection for this character was markedly effective. Heritability of leaf length was low (11%) and selection for this character had little influence. In spite of the relatively low heritability of node number (12%) selection was effective in increasing the expression of this character. A preponderance of the effects of recessive genes for high node number differentiated the parental varieties; this may have augmented the influence of selection. Non-allelic interactions were apparently not an important source of heritable variation. The paper concludes with a review of the reasons for expecting greater advances by selection and inbreeding than by the use of F_1 hybrids in naturally self-pollinated species.

2039. Noguti [Noguchi], Y.
(**On allopolyploids in tobacco. I. Morphological observations**).
Jap. J. Genet. 1942 : **18** : 105–06. [Japanese].

Brief details are given on leaf morphology, stomatal and pollen size, seed setting ability, moisture content of the seeds, and osmotic pressure of the cell sap, for allopolyploids involving the species *Nicotiana Tabacum, N. sylvestris, N. glutinosa, N. rustica* and *N. paniculata*.

2040. Okuma, K.
(**On the amphidiploid between *Nicotiana suaveolens* and *N. glauca***).
Jap. J. Genet. 1942 : **18** : 104–05. [Japanese].

Data are provided on the length of stem, leaf size and flower dimensions of *N. suaveolens, N. glauca*, the untreated interspecific hybrid, and the colchicine-induced amphidiploid hybrid.

2041. Inagawa, E.
(**On allopolyploids in tobacco. II. Cytological observations**).
Jap. J. Genet. 1942 : **18** : 107–09. [Japanese].

Chromosome pairing is described in the untreated and amphidiploid hybrids of *N. Tabacum* x *N. sylvestris, N. Tabacum* x *N. glutinosa* and *N. rustica* x *N. paniculata*. The data obtained furnish a basis for a discussion on chromosome affinities within the genus *Nicotiana*.

2042. Camus, G. C. and
Went, F. W.
Thermoperiodicity of different varieties of tobacco.
Amer. J. Bot. 1950 : **37** : 676–77. (Abst.).

Experiments on *Nicotiana Tabacum* have led to the conclusion that each variety has its characteristic optimum night temperature for growth habit, growth rate, flowering time and final plant weight. Changes in day temperature only affected the intensity of the reactions underlying the above four characters and caused no shifts in the critical night temperatures.

2043. Kehr, A. E.
A genetic explanation for tumor formation in *Nicotiana* hybrids.
Genetics 1950 : **35** : 672–73. (Abst.).

Sixteen interspecific combinations of *Nicotiana* produced tumours. Formation of tumours was especially marked when one or more genomes of *N. Langsdorffii* were combined with certain genomes from other *Nicotiana* species, apparently as the result of a disturbance of the growth regulatory mechanism, probably the auxin metabolism. Certain genome combinations, and most probably particular genes, disrupt the normal physiological balance of the plant; undifferentiated secondary growths arise from the various tissues as a direct result of these unbalanced metabolic processes.

2044. Okuma, K. and
Oka, H.
(On the fertility of autotetraploids).
Bot. and Zool. 1940 : **8** : 1196–98. [Japanese].

Figures are given of the number of seeds per capsule of a series of autotetraploids derived from four varieties and one F_1 hybrid of *Nicotiana rustica* and three varieties and one F_1 hybrid of *N. Tabacum*. The reasons for the reduced fertility of the autotetraploids are discussed.

2045. Noguchi, Y.
(The characteristics of autopolyploids in respect of their value for plant improvement).
Bot. and Zool. 1940 : **8** : 1493–96. [Japanese].

During the course of a review on the useful characters encountered in autopolyploids, the author presents data on the biochemical composition of tetraploid tobacco; it differs from diploid material in having a higher content of nicotine, organic acid, total nitrogen, ether extract, resin, calcium, potassium and magnesium, but less sugar, sulphate and phosphorus.

2046. Clayton, E. E. and
McMurtrey, J. E. (Jun.).
Tobacco diseases and their control.
Fmrs' Bull. U.S. Dep. Agric. 1950 : No. 2023 : Pp. 70.

Notes on disease resistant varieties of flue cured, burley, dark and cigar tobaccos now in use in the United States are included.

2047. Diachun, S. and
Troutman, J.
Multiplication of *Bacterium tabacum* in leaves of *Nicotiana longiflora*.
Phytopathology 1951 : **41** : p. 10. (Abst.).

Estimations of *B. tabacum* populations in artificially inoculated leaves of *Nicotiana Tabacum* (susceptible) and *N. longiflora* show that the initial increases in the number of

bacteria are equal but the increase continues to a higher level in *N. Tabacum.* In both species the bacterial population decreases after the first few days, accompanied by death of the tissue in *N. Tabacum* and continued normal growth in *N. longiflora.*
Interspecific hybrids, resistant to wildfire, are being developed from *N. longiflora* x *N. Tabacum.*

2048. Clayton, E. E.,
Heggestad, H. E.,
Grosso, J. G.,
Bowman, D. R. and
Schneider, E. O.
Breeding behavior and growth responses resulting from the transfer of wildfire resistance from *Nicotiana longiflora* to *N. tabacum.*
Phytopathology **1951 : 41** : p. 7. (Abst.).

After making the initial cross of wildfire resistant *Nicotiana longiflora* x susceptible *N. Tabacum*, one back cross to the susceptible parent and selfing produced a stable resistant line, T.L. 106, in which $2n = 24$; occasional lines of commercial value were obtained as early as the second back cross. Evidence of regular segregation from the ratio 3 resistant : 1 susceptible at the seventh back cross indicates that the control of wildfire resistance depends on a single pair of dominant genes; this resistance appears to be linked with reduced nicotine content.

2049. Keleny, G. P.
The effect of black-root-rot on growth of seedlings of four varieties of tobacco.
J. Aust. Inst. Agric. Sci. 1950 : **16** : 158–59.

Recently black root rot has been recorded in Victoria. Hickory King, the tobacco cultivated in this state, appears to be particularly susceptible under field conditions. Greenhouse tests were carried out on Hickory Pryor, KY 41 A and Yellow Special from the USA, and Harrison's Special 215 from New Zealand. The results confirmed previous observations of the susceptibility of Hickory Pryor. KY 41 A was the most resistant; the remaining two varieties were less resistant than KY 41 A but it is expected that under field conditions they would be much less affected than Hickory Pryor.

2050. Holmes, F. O.
Indications of a New-World origin of tobacco-mosaic virus.
Phytopathology **1951 : 41** : p. 17. (Abst.).

It seems probable that the distribution of tobacco mosaic virus was formerly more limited than it is to-day. Presence of the virus in any one area for a long duration could reduce the competitive vigour of susceptible species, at the same time encouraging resistant mutants. The high percentage of resistant Solanaceous plants in the New World is considered additional evidence for the hypothesis of the origin of the virus in that area.

2051. Carvalho, A.
As variedades do café e o seu melhoramento. (**The varieties of coffee and their improvement**).
Bol. Superintend. Serv. Café, S. Paulo 1950 : **25** : 687–93, 780–86.

Descriptions are given of the more important varieties grown in São Paulo. The work that has been done to improve these varieties is briefly outlined.

2052.
Fifteenth Annual Report of the Coffee Research and Exper mental Station, Lyamungu, Moshi 1948.
Pamphl. Dep. Agric., Tanganyika 1950 : No. 48 : Pp. 48.

A report is given of seedling and clonal selection trials and experiments on the comparison between clones and seedlings of the same mother trees.

2053. Leliveld, J. A.
Cytologische gegevens betreffende eenige cloonen van *Coffea "robusta."* (**Cytological data on a number of *Coffea* "*robusta*" clones**).
Arch. Koffiecult. Ned.-Ind. 1939 : **13** : 1–25.

With a view to further selection, cytological examination has been made of the Robusta clones SA and BP in East Java that had undergone selection at the Malang and Djember Experiment Stations respectively.
The haploid chromosome number was 11 except in a chimera discovered in SA 109 and a very dark green curly leaved type from SA 109 x BP 42, in both of which one or two extra chromosomes or, in some plates, fragments, were found. Meiotic irregularities were common probably owing to the hybridity of Robusta. Pollen studies, however, showed that dwarfed and shrunken pollen grains must also be a factor in defective pollination.
Numerous plates, showing the chromosomes of the various clones, and tables, recording the reliability of differences in total chromosome length in mitosis in crosses between various clones, are included.

2054. Snoep, W.
Enkele gegevens over de bloeigrootte en het bloeirendement, als productie-factoren, bij Robusta-koffie. (**Some facts about flower size and extent of flowering as yield factors in Robusta coffee**).
Arch. Koffiecult. Ned.-Ind. 1940 : **14** : 247–73.

As a contribution to the judging of coffee crops in Central and Eastern Java, a study was made on various estates of the following factors upon which the yield of market coffee is held to depend: (1) the number of flowers that open per unit of area; (2) the percentage set of berries from such flowers; and (3) the average weight of market coffee obtained per berry.
A further factor affecting yield, the incidence of pea berries, was also determined for 12 different clones in 1938 and 1939 in several districts. The percentage was found to vary only slightly in the different clones, with the exception of Bgn 83–03, a clone with small berries and recorded as having high percentages of pea berries on several occasions.

2055. Snoep, W.
Bepalingen omtrent de stuifmeelverspreiding door de lucht bij Robusta-koffie. (**Determinations relating to pollen distribution by the air in Robusta coffee**).
Arch. Koffiecult. Ned.-Ind. 1940 : **14** : 275–81.

The experimental methods used and the results of this study are recorded. It appears that it is only under highly favourable conditions that enough pollen is carried by the air to pollinate all stigmas present.
The possible use of determinations of pollen transference by the air to estimate the size of the future crop on coffee estates in Java is considered.

2056. Mäckel, H. G.
Über Polyembryonie, Mehrsamigkeit und Mehrfächrigkeit bei *Coffea arabica.* (**On polyembryony, multiple seeds and the multiloculate condition in *C. arabica***).
Ber. dtsch. bot. Ges. 1951 : **64** : 28–35.

Numerous cases of supposed polyembryony, cited in the literature of the subject, are critically discussed, together with some similar anomalies found in the author's own material.

2057. ROELOFSEN, P. A.
Onderzoekingen over beinvloeding en behoud van de kwaliteit van Robusta-marktkoffie. (**Investigations on influencing and preserving the quality of Robusta market coffee**).
Arch. Koffiecult. Ned.-Ind. 1939 : **13** : 151–281.

With the object of finding new methods of improving the quality of market coffee in the same way as already achieved for *Cacao*, the author investigated the influence of (1) the manufacturing process on quality and (2) the method of storage of the market product on the retention of quality.
The report deals first with anatomical and microchemical findings regarding the berry and the bean and with the death of the bean. The fermentation process, tests on the objective estimation of the quality of Robusta coffee, the effect of fermentation on quality, the cause of differences in colour of the market product, and methods and duration of drying are then considered. Observations on storage conditions and effects, on the state of the tree and on the variety and the stock, as factors affecting quality conclude the report. Incidentally a method for the proper preparation of small samples for testing is described.

2058. FLUITER, H. J. DE.
Voorloopige mededeeling omtrent een bladvlek- en twijginstervingsziekte bij *Coffea arabica*. (**Preliminary communication regarding a leaf spot and twig dieback disease in *C. arabica***).
Arch. Koffiecult. Ned.-Ind. 1940 : **14** : 225–46.

The above name has been provisionally given to a disease, affecting the young growing leaves and twigs of coffee trees in the Netherlands East Indies, and probably due to *Ascochyta Coffeae*, *Phyllosticta coffeicola* and *Phoma coffeicola*. Trees in plantations vary greatly in susceptibility, so selection for resistance might be effective.

2059. S'JACOB, J. C.
Resultaten van zaailingen toetstuinen in Besoeki. (**Results from test plantations of seedlings in Besoeki**).
Arch. Koffiecult. Ned.-Ind. 1938 : **12** : 57–108.

Results from test coffee plantations established from 6 to 11 years ago show that in general the BP seedlings are high grade planting material. BP 42 appears to be outstanding and BP 39, SA 24 and SA 56 were also good selections. The requisite number of trees and of replications and other essential conditions for successful trials are considered, as well as causes of variation, e.g. pollination, between replications in comparative tests.

2060.
Annual Report of the West African Cacao Research Institute, Tafo, Gold Coast April 1948 to March 1949 (1950) : Pp. 64.

Seedlings of E 1, P 4/9 and the Tafo selection TF 2 show promise. Certain types originating from the Upper Amazon region are outstanding as regards vigour and earliness of bearing; in 1948 the best progeny produced an average yield of 13·5 pods per tree at the age of four years. Second generation progeny of the Costa Rica clone 613 yielded an average of 4·1 pods per tree. The progeny of ICS 70, giving 2·8 pods per tree, is the best of the Trinidad types; West African Amelonado yielded only 11 pods from 266 trees. Significant differences in vigour, as shown by measurements of stem diameter, have been recorded for the various types, the Upper Amazon types being the most vigorous and West African Amelonado the least vigorous.
No viable embryos have been obtained from *Theobroma Cacao* pollinated by *Herrania* spp. *Herrania* flowers presumably pollinated by *Th. Cacao* have produced beans which resemble those of the female parents, and which are germinating well.

Using the characters of albinism and red axil spot as markers in seedlings, 23·7 and 18·4% natural cross pollination was detected, respectively. The former character is due to a single recessive factor.
The Criollo and Upper Amazon material gave the highest yields of butter fat in an analysis of selections from the plot of Trinidad introductions. Experiments to develop a method for the fermentation of the contents of only one or two pods are in progress (cf. Abst. 1253). Reaction to virus 1 A has been studied in one trial with rooted cuttings of local selections of Trinitario and Amelonado types, and another with seedlings of new introductions. A test is now being carried out to compare the five most resistant with the five most susceptible clones found in the first trial. The progenies of the new introductions have been tested at the bean stage; those showing resistance are being retested at the age of six months. Progenies of the cross between the Upper Amazon types Nanay and Parinari have shown considerable resistance to vector feeding on the cotyledon.

2061. Rosenquist, E. A.
Cocoa selection and breeding in Malaya.
Malay. Agric. J. 1950 : **33** : 181–93.

Details are given of the work of cacao improvement begun in Malaya during 1948. The selection and breeding programme is concerned with the Trinitario, Criollo and West African Amelonado types. The three types are now undergoing comparative trials, and legitimate and illegitimate progenies of Trinitario and Criollo cacao are under test. Use is being made of locally available material and introductions.

2062. Giesberger, G.
Eenige waarnemingen over de aantasting van *Cacao* door *Helopeltis*.
(**Some observations in infestation of *Cacao* by *Helopeltis***).
Arch. Koffiecult. Ned.-Ind. 1940 : **14** : 44–99.

A detailed study is recorded of research on the incidence of *Helopeltis* in *Cacao* and the environmental, biochemical, morphological or other possible causes of the differences in susceptibility to the pest, as observed between trees or even between beans on the same tree or on different trees.
It seems likely that resistance in a tree is due to some inherent properties which may be more or less hereditarily conditioned.

2063. Furusato, K.
(Polyploid plants produced with colchicine).
Bot. and Zool. 1940 : **8** : 1303–11. [Japanese].

Among the twelve species from which colchicine-induced tetraploids have been obtained are spinach, radish, *Papaver somniferum* and hemp.

2064. Bagge, H.
Forsøg med sorter af opiatvalmue 1941–1947. **(Trials with varieties of opium poppy 1941-1947).**
Tidsskr. Planteavl 1950 : **54** : 81–92.

During 1941–43, trials of four German varieties were held at five places in Denmark; and during 1944–47 the German variety Mahndorfer, which had done best, was tested at four places with the Dutch poppy Mansholt, and three new Danish varieties, the blue seeded and white seeded Pajbjerg and the blue seeded Øtofte. The origin of these five selections is given with notes on their performance. In both trials Mahndorfer surpassed the others in yield of seed, crude oil and straw (stems + capsules).

2065. Blattný, C.,
Antipovič, D. and
Osvald, C. V.
Předběžné studie o planých chmelech. (**Preliminary results of a study of wild hops**).
Věstn. Čsl. Akad. Zeměd. 1950 : **23** : 215–24.

During a study of wild hops in Czechoslovakia several strains possessing good economic properties were found. Their introduction into cultivation and use in breeding are being considered.

2066. Ono, T.
(**A triploid intersex in *Humulus japonicus***).
Bot. and Zool. 1940 : **8** : 1632–34. [Japanese].

Colchicine-induced tetraploid material of *H. japonicus* gave rise on fertilization to a triploid female plant ($2n = 24$) and a hypertriploid monecious intersex ($2n = 25$).

2067. Blattný, C. and
Osvald, C. V.
Přehled viros chmele. (**A survey of hop viruses**).
Sborn. Čsl. Akad. Zeměd. 1950 : **22** : 600–11.

The symptoms of 25 virus diseases and three forms of mosaic of hops in Czechoslovakia are described. Some of the diseases were observed for the first time in 1947 or in 1948, and some of the new viruses have not yet been identified. A study of the viruses, with special reference to their capacity to form complex viruses is in progress.
The measures recommended for the control of virus diseases include the use of the healthy Osvald clones Nos. 31, 72 and 114.

MINOR CROP PLANTS

2068. Maugini, E.
Ricerche cito-embriologiche sul genere *Piper*. (**Cytoembryological research on the genus *Piper***).
Caryologia, Pisa 1950–51 : **3** : 221–33.

The course of megasporogenesis and of the development of the female gametophyte in *P. geniculatum* and in *P. unguiculatum* is described in detail. Both species have the chromosome number $n = 14$; microsporogenesis in both is normal and almost identical in its main features.

2069. Hastings, D. M.
A record array of winners.
Sth. Seedsman **1951** : **14** : No. **3** : 18, 19, 22, 67.

In trials of All-America Selections in the southern states the following new vegetable varieties were awarded prizes: the pepper Vinedale, an early, dwarf variety from Harris Early Giant x Sunnybrook, which produces green fruits turning bright red when ripe; the spinach American, from the cross Viking x Bloomsdale, which has thick, glossy, dark green leaves and withstands bolting; the lettuce Salad Bowl, which forms a loose rosette of decorative, tender leaves and although fast growing is able to withstand bolting; the musk melon Golden Delight which shows a wide adaptability and produces elongated yellow-skinned fruits with shallow ribs and firm salmon coloured flesh of good quality; the pumpkin Allneck Cushaw which has a vigorous vine and produces grey-green fruits having solid orange coloured flesh, with a small seed cavity confined to the apical region; the snap bean Wade Bush, a variety resistant to common bean mosaic and powdery mildew,

with heavy yields suitable for marketing or processing; and the snap bean Stringless Hort, a dwarf variety producing long pods without fibres in the younger stages.

2070. Sinha, N. P.
The somatic chromosomes and meiosis in *Capsicum*.
Indian J. Genet. Pl. Breed. 1950 : **10** : 36–42.

Descriptions are given of the somatic chromosomes of *Capsicum frutescens*, *C. cordiforme*, *C. angulosum* and three varieties of *C. annuum*. The chromosome numbers of *C. cordiforme* and *C. angulosum*, not previously reported, are both $2n = 24$. Normal meiosis occurs in *C. cordiforme*; descriptions and diagrams of pollen meiosis, observed in a limited supply of *C. frutescens* flower buds, indicate that the division is completely asynaptic, resulting in the formation of a varying number of supernumerary microspores which are sterile. It is not known whether this irregularity is characteristic of the species as further material was unavailable. Some of the meiotic stages resemble those of a single asynaptic plant of *C. annuum*, described by Pal and Ramanujam (cf. *Plant Breeding Abstracts*, Vol. X, Abst. 647).

2071. Kedharnath, S. and
Parthasarathy, N.
Varietal differences in the breeding behaviour of colchicine-induced autotetraploids of chilli (*Capsicum annuum* L.).
Indian J. Genet. Pl. Breed. 1950 : **10** : 14–20.

No significant cytological differences were observed in the pollen mother cell divisions of two distinct autotetraploid strains of *Capsicum annuum*. Uneven distribution of chromosomes in both strains gave rise to a certain percentage of abnormal gametes; in the progeny of NP 51 only tetraploids were present whereas both tetraploids and aneuploids of different chromosome number were identified in the progeny of NP 34 Bunch Mutant. Investigations are being undertaken to assess the relative influence on the recovery of aneuploid plants of (1) the percentage of ovules which undergo prefertilization abortion, (2) chromosomally unbalanced female gametes which are unable to compete with normal ones and (3) unbalanced female gametes which are fertilized but abort at various stages during embryology. The comparatively low percentage of germination in seeds of NP 51 compared with NP 34 Bunch Mutant appears to be of importance in this connexion.

2072. Nishiyama, I.
(Studies on artificial polyploid plants. IV. Comparative studies on a polyploid series in red pepper).
Bot. and Zool. 1940 : **8** : 905–13. [Japanese].

Colchicine-induced tetraploids were obtained from the variety Taka no Tsume [Hawk's Talon] of *Capsicum annuum*. A haploid and a hypotriploid were also obtained. Meiosis in the haploid was highly irregular, and no pairing occurred. The tetraploids behaved more regularly; 24 bivalents were often formed, with occasional univalents and multivalents. The higher polyploids displayed the usual gigas characters. The tetraploids were characterized by reduced fertility.

2073. Hare, W. W.
Resistance to nematodes in pepper.
Phytopathology 1951 : **41** : p. 16. (Abst.).

Santanka, Anaheim Chile and Italian Pickling are some of the varieties of *Capsicum frutescens* which showed high resistance to galls and root destruction caused by nematodes. Many commercial varieties were susceptible.

2074.

Researches on essential oils of the Australian flora.
Mus. Technol. Appl. Sci., Sydney 1948 : **1** : Pp. 19.

Penfold, A. R., Morrison, F. R. and McKern, H. H. G. — *Studies in the* Myrtaceae *and their essential oils. Part I. The seasonal variations in yield and cineole content of* Melaleuca alternifolia *Cheel.* (*pp. 5–7*).

In a study of seasonal variations in yield and cineole content of *M. alternifolia*, undertaken as a basis of future seed selection, it was found that in respect of both characters, each tree appeared to behave as an individual; tree No. 46/49, maintained at all times an oil yield superior to that of the others.

Penfold, A. R., Morrison, F. R. and McKern, H. H. G. — *Studies in the* Myrtaceae *and their essential oils. Part II. Some sources of error in the study of plant populations:* Eucalyptus citriodora *Hook.* (*pp. 8–11*).

The technique of leaf sampling was studied, as a preliminary to seed selection of individual trees of *E. citriodora.*

Penfold, A. R., Morrison, F. R. and McKern, H. H. G. — *Studies in the physiological forms of the* Myrtaceae. *Part I.* Leptospermum citratum *Challinor, Cheel and Penfold and its physiological forms.* (*pp. 12–17*).

The results of an analysis of the oils from the progeny of the two physiological forms of *L. citratum*, termed variety A and variety B respectively, are reported (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 1267).

Penfold, A. R., Morrison, F. R. and McKern, H. H. G. — *Studies in the physiological forms of the* Myrtaceae. *Part II. The occurrence of physiological forms in* Melaleuca alternifolia *Cheel.* (*pp. 18–19*).

Wide variation in cineole content was found among trees of *M. alternifolia* collected from natural stands in New South Wales. The data obtained indicate the existence of physiological forms. The breeding behaviour of the variants is under investigation. Pending the results of this study, it is proposed, for commercial purposes, to designate the variants as variety A, with a medium cineole content of 30 to 45%, and variety B, with a high cineole content of 54 to 64%.

2075. Sinskaja, E. N.
(The study of biological and physiological development of oil bearing plants at VNIIMK*).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1950 : No. 7 : 26–31. [Russian].

The following post-war research has some bearing on plant breeding.

Lallemantia

It proved relatively easy to alter the growth habit of wild *Lallemantia peltata* by changing its sowing dates. Cultivation of the wild species, selection and training involving autumn and late autumn sowing are regarded as more promising than interspecific hybridization. The wild species proved hardier than *L. iberica*. The future aims in breeding are greater hardiness and the development of a method for improving fertility of interspecific hybrids.

Elsholtzia cristata

Short day hastened development, but at the same time had a stunting effect upon the plants and reduced their productiveness. The species proved susceptible to drought. It is considered that the cultivation of this plant has greater scope in northern districts than in the south.

* Vsesojuznyĭ Naučno-Issledovateljskiĭ Institut Masličnyh Kuljtur [USSR Scientific Research Institute for Oil Crops].

Flax

Experiments showed that varietal differences in the lengths of the stems were determined by (1) length of light phase, (2) fast growth rate, especially during the so-called maximum growth phase, and (3) the length of the maximal growth phase. The relative importance of these factors varied with individual varieties and populations and their study opens up new possibilities in breeding fibre flax and dual purpose flax for tall stems. Study of the light requirements of flax and linseed showed that some varieties, such as Udžan, are sensitive in their response to curtailed light after passing through their light phase. This has the effect of delaying flowering. The varieties have been arranged into groups according to their tolerance of shading and this will help to determine the optimum sowing density for each variety. This aspect is particularly important in work with fibre flax and dual purpose flax. Of the linseed varieties tested for resistance to drought, a Tadžik variety, Dagana kiik, was the least susceptible to wilting.

Sunflower

The resistance to drought of most varieties, including 4036 and 4418, was higher during the time of the formation of seed heads than during flowering, but some varieties, such as 228 and 1646, showed a higher degree of drought resistance during the flowering phase. Experiments with grafted sunflower plants showed that resistance to *Orobanche* is associated with the root system of the stock and is not caused by changes in assimilation processes.

Sesame

The varieties of sesame developed at the USSR Institute for Oil Plants possessed the highest resistance to drought.

Camelina

Of the varieties tried, VNIIMK 17 possessed the highest resistance to drought.

2076. Andersson, G.
Svalöfs Matador höstraps. **(The Svalöf autumn rape Matador).**
Sverig. Utsädesfören. Tidskr. **1950 : 60 : 380–84.**

Autumn rape breeding by the Swedish Seed Association has been directed towards the production of (1) a variety surpassing Lembke's rape in yield and oil content of the seeds, and (2) a variety more winter hardy than Svalöfs Senraps [Svalöf Late rape] and at least equal to Senraps in yield and preferably as good as Lembke's in quality. Svalöfs Matadorraps (Sv 02) represents a marked step towards the first of these two aims; it was obtained by pedigree selection and put on the market in autumn 1949. In view of its performance in trials for winter hardiness, resistance to shedding, fertility and oil content, it can be recommended in all areas where oil crops are grown on the Swedish mainland (cf. Abst. 871).

2077. Iljina, A. I.
(The initiation of primordia of the central inflorescence in castor oil).
Agrobiologija (Agrobiology) **1950 : No. 5 : 146–48.** [Russian].

Comparative studies at the USSR Scientific Research Institute for Oil Crops in Krasnodar, of the varieties Kruglik 5 and Sanguineus 401 during the different growth phases beginning with the first leaf stage, are reported.

2078. Frolov, P.
(Linseed—a lucrative crop).
Kolhoznoe Proizvodstvo (Collective Farming) **1950 : No. 12 : Pp. 20.**
[Russian].

Reference is made to the following varieties which have been made standards for Siberia and Kazahstan: Sibirjak [Siberian], VIR* 1650, Voronežskiĭ 1308 [Voronež 1308] and VNIIMK† 5237.

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* Vsesojuznyĭ Institut Rastenievodstva [USSR Institute of Plant Industry].
† Vsesojuznyĭ Naučno-Issledovateljskiĭ Institut Masličnyh Kuljtur [USSR Scientific Research Institute for Oil Crops.]

2079. Deshpande, R. B.
A note on the investigations on breeding rust-resistant linseeds at the Indian Agricultural Research Institute.
Indian J. Genet. Pl. Breed. 1950 : **10** : 7–13.

Several early maturing hybrids with resistance to *Melampsora Lini* have been obtained from crosses involving susceptible early maturing New Pusa strains and rust resistant varieties imported from Australia. Preliminary yield trials show that some of the resistant hybrids produce superior yields in certain localities; trials are to be conducted in all linseed growing areas.

2080. Heiser, C. B. (Jun.).
The sunflower among the North American Indians.
Amer. J. Bot. 1950 : **37** : 662–63. (Abst.).

The former cultivation and uses of the sunflower among the North American Indians are described. The sunflower is unique among cultivated plants in that it is one of the few crop plants which has been domesticated in temperate North America and one of the few cultivated crops whose wild ancestor still exists. The origin of the cultivated sunflower apparently underwent the following stages: (1) use of the wild plant, (2) rise of a weed form, and (3) actual cultivation of the weed form, leading to the development of a truly domesticated type.

2081. Lutikov, I.
(For an extensive introduction into industry of sunflower varieties with a high oil content).
Kolhoznoe Proizvodstvo (Collective Farming) 1950 : No. 9 : 23–24. [Russian].

The most important Soviet varieties of sunflower showing resistance to *Orobanche* and *Homeosoma nebulella* are 8281, 1813, 1646 and 6540. The last two are also remarkable for a high oil extraction ratio, which is over 45%. Both varieties have shown promise in state tests and have been recently made standards in several sunflower growing districts.
Élites of 1646 and 6540 have recently been improved at the USSR Scientific Research Institute for Oil Crops, with the result that the oil yield was increased by about 2%.
Mention is made of varieties 4966 and P–10, also having good oil extraction ratios.

2082. Wilshaw, R. G. H.
Agronomic and breeding research on rice, oil-palms, and cacao in Malaya. Pt. II. Oil-palms and cacao.
Emp. J. Exp. Agric. 1950 : **18** : 276–80.

Oil palm improvement has been carried out by the Department of Agriculture since 1921. Palms selected from one estate gave encouraging results during a ten-year period; they were selfed and intercrossed and the progenies were planted at Serdang in 1937, 1939 and 1940. Two of the progeny lines, E 211 and E 268, have given significantly higher yields than the others; line E 93 has produced fruits with a high percentage of pericarp. One of the original palms, E 206, showed a small annual increment in height and exceptional girth; its selfed progeny have bred true for these characters. This dumpy form is of particular interest since the slow growth habit favours easier harvesting and longer economic life. Crosses have been made between E 206 and normal palms. The present objectives of breeding work are the production of dumpy and standard types with high yielding capacity and pericarp percentage, and if possible, elimination of the partial sterility of the dumpy form. Additional parental material is being sought in Malaya and introductions from other countries.
In the section reviewing experiments on cacao it is stated that a comprehensive programme of selection and breeding has begun with locally available material and that introduction of further types is now under consideration.

2083. Poerck, R. A. de.
Contributions à l'étude du palmier à huile africain (*Elaeis guineensis* Jacq.). [**Contributions to the study of the African oil palm (*Elaeis guineensis* Jacq.)**].
Oléagineux Rev. Gén. Corps Gras Dérivés 1950 : **5** : 689–94.

Continuing his investigation (cf. Abst. 1276), the writer discusses the reported incidence of sterility in *pisifera* palms at various research centres in Africa. He believes that the difficult germination of this type of palm could be remedied and that the gene (or genes) conditioning defective embryo sac formation could be eliminated by selection. Some particulars are set out of an anatomical study of embryological development in unfertilized *tenera* palms, in unfertilized, sterile *pisifera* palms, in sterile fertilized *pisifera* and in fertile *pisifera*.
From a cytological examination of *dura* and *tenera* and *pisifera* varieties of *E. guineensis* it is concluded that $n = 16$, though some metaphase plates appeared to show a supernumerary element, about whose identity there was, however, invariably some doubt. In *E. melanococca*, which is interfertile with the above species, $n = 16$ was also found.

2084. Cayeux, H. and
Cayeux, L.
Nouvelles *Digitales* hybrides. (**New *Digitalis* hybrids**).
Rev. Hort., Paris 1950 : **122** : p. 156.

Continuing their work on interspecific hybridization of *Digitalis*, the authors here describe two new hybrids, *D. ambigua* x *D. ferruginea* and *D. lanata* x *D. ferruginea*. The latter, being a giant type, has been named *Digitalis ferruginea major*.

2085. Baldwin, J. T. (Jun.).
Cytogeography of *Strophanthus* in West Africa.
Amer. J. Bot. 1950 : **37** : p. 660. (Abst.).

The geographical and ecological distribution, habit and chromosomes of *Strophanthus* species in West Africa have been investigated.

2086. Raghavan, T. S. and
Venkatasubban, K. R.
Studies in the Indian Scilleae. IV. The cytology of triploid *Urginea indica* Kunth.
Cytologia, Tokyo 1940 : **11** : 71–92.

Diploid and triploid *U. indica* are compared, and a positive correlation is reported between gigas characters and chromosome number. The growth rate of the floral scape proved higher in the triploid than in the diploid. Various meiotic irregularities in the triploid are described. The possible origin of triploids and the existence of sterility in triploid plants are discussed.

2087. Silva, C. A. de.
Notes on sources of clonal seed in Ceylon.
Quart. Circ. Ceylon Rubb. Res. Scheme 1949 (1950) : **26** : 31–32.

Experimental plantings of clonal seed of rubber were established in 1946 and 1947 to supply information on the potentialities of clonal parents in seed gardens on estates in Ceylon. Clone TJ 1 is a reliable seed parent and selfed seed of this clone has given encouraging results in the first four years of tapping; other promising seed bearers include MK 3/2, BS 3, BD 10 and GL 1.

2088. YOUNG, H. E.
Natural resistance to leaf mildew of *Hevea brasiliensis* by clone LCB. 870.
Quart. Circ. Ceylon Rubb. Res. Scheme 1949 (1950) : **26** : 6–12.

In trials in Ceylon the Indonesian rubber clone LCB 870 has shown a high degree of resistance to leaf mildew (*Oidium Heveae*). This resistance is associated with the rapid development of the cuticle and the early attainment of leaf maturity, compared with other clones; in LCB 870 cuticle maturity is reached before the leaflet has fully expanded. Thus there is only a short period in which damage can be caused. The valuable characteristics of mildew resistance and vigour of LCB 870 are however offset by its low yield; budding methods of overcoming this disadvantage are discussed. Hybridization of the clone with high yielding varieties is in progress. Preliminary tests for resistance are to be carried out on the resulting seedlings by investigation of the cuticle. The possibility of producing graft chimeras with external tissues of LCB 870 is also being explored.

2089. SILVA, C. A. DE
Yields of budded rubber and clonal seedlings in commercial tapping.
Quart. Circ. Ceylon Rubb. Res. Scheme 1949 (1950) : **26** : 26–30.

Data on the yields of budded clones and clonal seedlings in commercial tappings in Ceylon are summarized.

2090. OKABE, S.
[**Artificially induced polyploids of *Taraxacum* (preliminary note)**].
Jap. J. Genet. **1942** : **18** : 277–78. [Japanese].

Experiments on the induction of polyploids in *T. platycarpum*, *T. longe-appendiculatum*, *T. japonicum* and *T. elatum* are described. Meiosis is described in 4*n* *T. platycarpum*, 3*n* *T. longe-appendiculatum* and 4*n* *T. longe-appendiculatum* x 4*n* *T. platycarpum*.

2091. GERSTEL, D. U.
On the effect of species-foreign pollen on self-incompatible guayule.
Genetics 1950 : **35** : p. 666. (Abst.).

Two self incompatible plants of *Parthenium argentatum* grown with *P. lyratum* in isolation produced progenies of the mother species. Twelve sibs of one progeny were tested for their incompatibility relationships; two plants were compatible with the remaining ten; the group of two plants and the group of ten were each intrasterile. Probably the pollen tubes of *P. lyratum* weakened the incompatibility reaction of the stigmas of *P. argentatum*.

2092. BRAAK, H. R.
Winning en bereiding van guttapercha op de landsonderneming "Tjipetir" (Pusat Perkebunan Negara). [**Obtaining and processing guttapercha on the "Tjipetir" estate (Pusat Perkebunan Negara)**].
Bergcultures 1951 : **20** : 79–84.

The plantation on the above estate has consisted mainly of *Palaquium Gutta*, *P. oblongifolium*, *P. borneense*, *P. Treubii* and *Payena Leerii*. The last two types, having proved inferior from the standpoint of quality, were to be eliminated as far as possible, though, unfortunately, some hybridization had already taken place.

2093. Enikeev, H. K.
(For a quicker introduction of new varieties into industry).
Sad i Ogorod (Fruit and Vegetable Gardens) 1950 : No. 11 : 11–14. [Russian].

Breeding work with pome fruits, stone fruits and small bush fruits at the Moscow Fruit Research Station (cf. Abst. 44) is described. The hardy apple varieties Desertnoe [Dessert], Arkad Novyĭ [New Arkad], Ijuljskoe [July], Pobeda [Victory], Slava [Glory], Jubileĭnoe [Jubilee] and Standart [Standard] were obtained from crosses between central Russian varieties and southern apple varieties. The new varieties are being reproduced upon Chinese crab stocks selected at the research institute. Of the best new plums, the variety Pamjati Timirjazeva [Timirjazev's Memorial] is remarkable for its hardiness. Like Iskra [Spark], Želtaja Desertnaja [Yellow Dessert], Izobiljnaja [Abundant], Skoroplodnaja [Early Fruit] and Renklod Severnyĭ [Northern Gage] it was bred from hardy local plums x southern varieties.
The new cherries Smena [Change], Birjulevskaja, and Avgustovskaja [August] were obtained by the same method.
The breeding results with gooseberries and strawberries have already been reported (cf. Abst. 632).

2094. Oldén, E. J.
Studieresa till England. **(A visit to England for the purpose of study).**
Sverig. Pomol. Fören. Årsskr. 1950 : **51** : 131–54.

This report, by a Swedish visitor from the Balsgård institute for fruit breeding, deals largely with the research on many aspects of fruit production and breeding at East Malling Research Station. Visits to Wye College and the John Innes Horticultural Institution and some large fruit farms in Kent are also described.

2095. Danielsson, B.
Embryokulturer av stenfruktträd. **(Embryo cultures of stone fruit trees).**
Sverig. Pomol. Fören. Årsskr. 1950 : **51** : 200–06.

At the Balsgård Institute, Sweden, research was carried out on culturing immature embryos of early varieties of sweet cherry and also of peaches and plums, using the methods of Tukey and of Lammerts (cf. *Plant Breeding Abstracts*, Vol. XV, Abst. 542 and Vol. XIII, Abst. 284). The present report tabulates and discusses the successful results obtained with cherry hybrids from crosses in which the pistillate parent was an early variety.
The embryo culture technique can also be combined with induction of polyploidy with colchicine.

2096. Granhall, I.
De fysiologiska grunderna för fruktträdens köldhärdighet. **(The physiological basis of winter hardiness in fruit trees).**
Sverig. Pomol. Fören. Årsskr. 1950 : **51** : 281–91.

The greater part of this article deals from the theoretical aspect with: various kinds of winter injury; winter killing and hardening; autumn frosts, cold damage and dormancy; and effects of early, late and spring frosts.
In the research programme of the Balsgård Institute of the Association for Fruit Tree Breeding the production of breeding material and varieties that are resistant to cold and winter killing is a major aim and a 5-point grading (A-E) of apple and pear varieties according to hardiness, as shown by low temperature laboratory tests, is recorded (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 1861). Groups A and B have been freely used at Balsgård in about 100 crosses in breeding for true winter hardiness, i.e. hardiness during dormancy. The hardiest progenies were five from Guldborg (B) x Transparente Blanche (A)

but three trees from Ontario (D) x Filippa (C) were very good and so were several progenies from Ribston (C). All these selections were diploids.
Tests of about 50 tetraploids showed all five degrees of hardiness to be present, so many will be useful in the scheme suggested by Nilsson-Ehle for the production of triploids The hardiest tetraploids were usually derived from Ribston.
Many of the hardy varieties are typical summer apples but the correlation is not always found, e.g. in Åkerö, Rossvik, McIntosh and Slava Petersburg [Glory of Petersburg].
A most important task for Balsgård is the breeding of winter hardy trees with fruits that store well.
Varietal differences have been found in resistance to frosts at flowering time and Hans Mathiesen, Crawley Beauty and Kunglig Kortstjälk [Royal Short Stem], which possess that characteristic, are being used as parents in hybridization to obtain extremely late flowering types.
Hardiness in pears, plums, cherries and hazels also calls for investigation; and the allied problem of frost resistant stocks has already been tackled by freezing tests by means of which some hardy new stocks for apples, pears and stone fruits have been selected.
Experts and other persons interested in fruit production and research are asked to report any winter hardy, lesser known local varieties to the Balsgård Institute.

2097.

Stations fédérales d'essais viticoles, arboricoles et de chimie agricole, à Lausanne et à Pully. Rapport d'activité 1949. **(Federal stations for research in viticulture, arboriculture and agricultural chemistry at Lausanne and Pully. Report of work in 1949).**
Landw. Jb. Schweiz. **1950 : 64** : 729–886.

Apples
The resistance of varieties of apple to canker was noted.

Pears
The set from varietal crosses and the date of maturity of the fruits were recorded. In general the hybrids from Bergamotte Esperen x Clairgeau were much later than Bergamotte Esperen x de Tongres hybrids. The use of Passe Crassane in crosses resulted in a high proportion of late types.

2098. Sonesson, N.
Sveriges Pomologiska Förening 50 år. **(The Swedish Pomological Association—50 years).**
Sverig. Pomol. Fören. Årsskr. **1950 : 51** : 17–108.

This report deals with the foundation, organization and achievements of the Association. It contains short sections on various aspects of the variety problem, including: (1) surveys of varieties, their value and nomenclature; (2) regional adaptation; (3) the organization of fruit shows to test the value of Swedish local varieties and, ultimately, of varieties of commercial value; and (4) the various organizations promoting breeding operations.

2099. Shay, J. R. and
Hough, L. F.
Variation in pathogenicity of *Venturia inaequalis* to scab-resistant *Malus*.
Phytopathology **1951 : 41** : p. 32. (Abst.).

Thirty-four single spore cultures of *V. inaequalis* have been used to inoculate scab resistant *Malus* species. It is hoped that differential isolates will be obtained, which will provide evidence of the gene relationships controlling the resistance possessed by the various *Malus* clones; the results will be used in a scab resistance breeding programme.

2100.

New apple named.
Amer. Nurserym. 1950 : **92** : No. **11** : p. **47.**

The variety Monroe, from a cross between Jonathan and Rome Beauty, has been released by the New York State Agricultural Experiment Station for trial by growers. It is a late keeping, yellow fleshed apple with good quality.

2101. Voskresenskiĭ, V. I.
(Exhibition of fruits and vegetables in Tambov).
Sad i Ogorod (Fruit and Vegetable Gardens) 1950 : No. **12** : p. **64.**
[Russian].

The exhibits shown during October 1950 at Tambov included new apple varieties, bred at the Mičurin Scientific Fruit Research Institute. The following hybrids were remarkable for good size and attractive appearance of their fruits: Antonovka x Golden Grimes, MacIntosh Antonovka x Golden Grimes, Papirovka x Beljfler Kitaĭka [Bellefleur Chinese Crab], Pepin Šafrannyĭ [Saffron Pippin] x Maljta Bagaevskogo [Bagaevskiĭ Malta] and Pepin Litovskiĭ [Lithuanian Pippin] x Beljfler Kitaĭka.

2102. Margolin, A. F.
(Dwarf apples in the Moscow province).
Sad i Ogorod (Fruit and Vegetable Gardens) 1950 : No. **12** : **5–7.**
[Russian].

Papirovka, Borovinka, Antonovka Obyknovennaja [Common Antonovka], Pepin Šafrannyĭ [Saffron Pippin], Koričnoe [Brown], Grušovka Moskovskaja [Moscow Pear], Anis and Osennee Polosatoe [Striped Autumn] are good hardy apple varieties suitable for cultivation on dwarfing rootstocks in the Moscow province.

2103. Egorov, V. I.
(More attention is needed for dwarf fruit trees),
Sad i Ogorod (Fruit and Vegetable Gardens) 1950 : No. **12** : **3–5.**
[Russian].

Trials of the following dwarfing rootstocks in the central belt of the USSR are recommended: hybrids between dwarf Siberian crab and dwarf cultivated apple varieties for apples, black fruited rowan for pears, *Amelanchier* for some varieties of pear, and sloe for plums.

2104. Maurer, K. J.
Vorläufiger Bericht über einen Stamm- bzw. Gerüstbildnerversuch.
(Preliminary report on an experiment with stem and frame builders).
Züchter 1950 : **20** : **346–52.**

At the 1948 Warsaw Conference of Pomologists the apple varieties Antonowka, Hibernal, Fredrowka and Ananas Berzenicki were judged to be the best for general use as frame builders. Hilkenbäumer, however, testing Antonowka under Western European conditions, decided against its use. The present author therefore made tests at Giesenheim to compare Antonowka with 12 other apple varieties, as regards vigour of growth in the first year after budding. Antonowka showed the greatest average diameter of all the varieties and Safran Antonowka was third as regards average height.

2105. Kordon, R. Ja.
(Caucasian dwarfing apples).
Sad i Ogorod (Fruit and Vegetable Gardens) 1950 : No. **12** : p. **10.**
[Russian].

Reference is made to a collection of Caucasian dwarfing apples called in Georgian collectively Hamanduli, at the Goriĭskaja Fruit and Vegetable Research Station. The tree size of the

most stunted forms is 30–40 cm., others are 1–1·5 m. The forms differ in respect of their fruit size and fruit flavour but have in common a short growth period, early regular bearing and hardiness.

2106. *Budagovskiĭ, V. I.
(Own rooted dwarfing apple trees in Dagestan).
Sad i Ogorod (Fruit and Vegetable Gardens) 1950 : No. 12 : 7–9. [Russian].

Several similar forms of own rooted dwarfing apples are cultivated in Dagestan, where they are known as Gem-Alma or Dipček-Alma [Pot Apple]. The name suggests that the variety originated from Azerbaĭdžan.
The various forms are described.

2107. Petrahilev, I.
(Protective forest belts for orchards in the steppes of Siberia).
Kolhoznoe Proizvodstvo (Collective Farming) 1950 : No. 6 : 23–24. [Russian].

Notes on mutual help and competition between various plant species include a reference to a Siberian practice of mixed planting of early bearing semicultivated apple varieties with at first less productive but long lived Reinette varieties such as Ranetka Purpurnaja [Purple Reinette], Bagrjanka Kaščenko [Kaščenko Purple Red] and Sejanec Kravčenko [Kravčenko's Seedling].

2108. *Byňov, F. A.
(Local varieties of apple).
Sad i Ogorod (Fruit and Vegetable Gardens) 1950 : No. 12 : 26–27. [Russian].

Ten new hardy apple seedling varieties, including Kungurskoe Ananasnoe [Kungur Pineapple] and Kungurskoe Raspisnoe [Kungur Painted] which have been made standards in the Molotov province, were developed in the Urals. These varieties bear better quality fruit than some central Russian varieties.
Descriptions are given of Kungurskoe Ananasnoe, Očerskiĭ Rozmarin [Očersk Rosemary], Kamskoe [Kama], Lukovka [Bulb], Krymka [Crimean], Nalivnoe [Juice], Uralec [Ural], Krasnoe [Red] and Motyrevka [Motyreva].

2109. *Žavoronkov, P. A.
(New hardy apple varieties for the southern Urals).
Agrobiologija (Agrobiology) 1950 : No. 4 : 94–99. [Russian].

The results of Mičurinite breeding work with apples at the Čeljabinsk Fruit and Vegetable Research Station are reported.
Descriptions are given of several new varieties which are adapted to cultivation in the southern Urals.
These varieties, developed during the past fifteen years, comprise very hardy small fruited apples, less hardy varieties with larger fruits, including a seedling selection Vysokoe [Tall] which has been made a standard for the Čeljabinsk province, and several seedlings listed below which are superior to the central Russian varieties in respect of fruit size, fruit flavour and hardiness.
Renet Uraljskiĭ [Ural Reinette], selected from Arkad Želtyĭ [Yellow Arkad], is a medium tall tree. It is a productive autumn variety. The fruits are round and green with pink striped cheeks. They have a cream flesh which has a good flavour, and weigh 72 grm.

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* An extended summary of this paper is on file at the Bureau.

Uraljskoe Zolotoe [Ural Golden], selected from Arkad Želtyĭ, is a vigorous tree. The fruits weigh 77 grm. They reach maturity in late summer and are pale golden, ribbed and cylindrical. The flesh is cream and has a good flavour.
Sejanec Arkada Želtogo [Seedling of Yellow Arkad] is a vigorous variety reaching maturity in late summer. The fruits are round, golden yellow and with blunt ribs and weigh 60 grm. The flesh is yellow and has good consistency and flavour.
Uraljskoe Rebristoe [Ural Ribbed] was selected from a Skryžapelj seedling. It is a vigorous variety reaching maturity in autumn. The fruits are ribbed and have an asymmetrical flattened shape. They are green with faint red cheeks and greenish white flesh. The flavour is satisfactory.
Uraljskoe Zimnee [Winter Ural] was also developed from Skryžapelj. The tree is tall and resistant to frost damage. The fruits, which keep until February, are ribbed and conical, and weigh 101 grm. They are dark green with a red cheek, and turn paler during storage. The flesh is greenish and has a good flavour. The variety is productive. Zelenoe [Green] was derived in the same manner as the above two varieties. It is a tall tree. The fruits weigh 140 grm. and keep until December. They are dark green with a red cheek. The flesh is greenish and has good consistency and flavour.

2110. Gollmick, F.
Beobachtungen über den Apfelmehltau. (**Observations on apple mildew**).
NachrBl. dtsch. PflSchDienst **1950** : **4** : 205–14.

Work on the large apple collection of the Naumburg Branch Station of the Biological Central Institute for Agriculture and Forestry showed that there are a number of high grade cultivated varieties which exhibit marked resistance to mildew. The severity of attack by the fungus is related to the incidence of perithecia. The significance of the formation of perithecia in judging varietal susceptibility is indicated.
Study of *Malus* species and hybrids showed that only members of the Formenkreis of *M. pumila* tend to be severely attacked by mildew; severe attack, or formation of perithecia, was only found in other wild apples and hybrids when derived from *M. pumila*; all other wild species seem to be highly resistant.
Investigation of susceptibility in progeny of seedling hybrids in which one parent in each case was the Ontario apple proved that varietal behaviour towards mildew is conditioned genotypically.

2111. Keitt, G. W. and
Boone, D. M.
Gene pairs conditioning pathogenicity in *Venturia inaequalis*.
Phytopathology **1951** : **41** : 19–20. (Abst.).

Observations on various crosses of *V. inaequalis*, in respect of the lesion-fleck reaction on certain apple varieties have provided evidence of three independent gene pairs determining the inheritance of pathogenicity. One pair conditioned the lesion-fleck reaction of Haralson, the second of McIntosh and Yellow Transparent and the third of Red Astrachan and Yellow Transparent. Since genes controlling the reaction of Yellow Transparent were at two loci, a study of their interaction was possible. The genes causing flecking appeared to be epistatic to those producing lesions.

2112. Nikitina, N. V.
(Exhibition in Tula).
Sad i Ogorod (Fruit and Vegetable Gardens) **1950** : No. **12** : p. 65. [Russian].

Mention is made of a new pear developed by V. S. Kostin. It bears attractive fruits weighing 280 grm.

2113. *Neporožnyĭ, G. D.
(New pear varieties for the Voronež province).
Sad i Ogorod (Fruit and Vegetable Gardens) 1950 : No. 12 : 28–30. [Russian].

Breeding work with pears in the southeastern districts of the Voronež province is reported. During the period 1937–1950 over 1000 hybrids were obtained but less than half survived under the severe climatic conditions. The best crosses were those involving Bere Zimnjaja Mičurina [Mičurin's Winter Beurré] or Lesnaja Krasavica [Forest Beauty] as one or both parents. Such hybrids showed greater resistance to drought and cold.
Descriptions are given of the hybrids which are being multiplied for élites.

2114. Carpenter, T. R.
The elimination of fireblight-susceptible individuals in interspecific crosses of pear.
Phytopathology 1951 : **41** : p. 6. (Abst.).

The reactions of F_1 seedlings of the cross *Pyrus ussuriensis* x *P. serotina* to inoculations with *Erwinia amylovora* at different growth periods are described. A higher percentage of susceptible individuals was eliminated in groups originally inoculated during early growth stages in the greenhouse than from similar progenies initially inoculated in the first year nursery. Seedlings inoculated in the greenhouse showed a greater tendency to gain in resistance during the second and third year inoculations than seedlings inoculated initially in the first year nursery. The most favourable temperature for eliminating susceptible individuals was 25–26° C.

2115. Evreinoff, V. A.
L'origine du cognassier et de ses variétés. **(The origin of the quince and its varieties).**
Rev. Hort., Paris 1950 : **122** : 11–14.

Varieties from Europe, North America and the Near East are listed, with an introductory note on the origin of the quince and its introduction into cultivation.

2116. Stepanenko, D. P.
(A hybrid between the Japanese plum† and a red fruited myrobalan).
Sad i Ogorod (Fruit and Vegetable Gardens) 1950 : No. 12 : 65–66. [Russian].

As a result of cross pollination of the Japanese plum with a wild form of red fruited myrobalan in the Čuĭ valley, Kirgizia, two fertile hybrids were obtained. The hybrids bore dark red fruits of intermediate size and better flavour than the fruits of either parent. One of the hybrids was remarkable for its capacity to produce offshoots. It also had spines, a character absent in both parent forms. An offshoot of this hybrid designated Kzyl Pioner [Red Pioneer] showed promise as breeding material. It came into bearing in August 1949, yielding 2·5 kg. fruits, each weighing 10·5 grm. The fruit was wine red and of good flavour. The tree showed resistance to pests and windfall. Grafted on Ugorica plum stocks the variety bears fruit in the second year. Further improvement of fruit size is being attempted by using the Chinese Madzuma plum as mentor. The new hybrid is expected to be sufficiently adapted to the severe climatic conditions of the T'ien Shan province.

2117. Avidov, Z. and
Svirsky, A.
(The appearance and control of the plum sawfly in 1950).
Hassadeh 1950 : **31** : 97–99. [Hebrew].

Differences in resistance to sawfly attack have been observed among plum varieties.

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* An extended summary of this paper is on file at the Bureau.
† *Prunus salicina* [= *P. triflora*].

2118. Lihovicer, V. G.
(Disturbances in the development of ovules during the reproductive process of distant cherry hybrids).
Bot. Ž. (Bot. J.), Kiïv 1949 : **6** : No. 2 : **24–31.** [Ukrainian].

Sterility of the hybrids *Prunus Cerasus* x *P. avium* was investigated at the Ukrainian base of the Mičurin Scientific Research Institute of Fruiticulture. The material comprised the hybrids from Ljubskaja x Dragana Želtaja [Yellow Dragana] pollinated with the pollen of Dragana Želtaja, Ljubskaja and Napoleon, and the pollen mixtures Ljubskaja + Napoleon and [Vladimirskaja (Vladimir) x Dragana Želtaja] + (Ljubskaja x Dragana Želtaja) + [Zaharjevskaja (Zaharjev) x Napoleon]. Embryological analyses showed that the sterility of the *P. Cerasus* x *P. avium* hybrids was due to the malformation of the ovules, embryo sac and nucellus, degeneration of the ovule integument and the disrupted development of mechanical tissues, before pollination. In a few instances normal development of the embryo sacs was observed.

2119. Zelenskiĭ, M. A.
(Directed training of hybrid cherries for hardiness).
Sad i Ogorod (Fruit and Vegetable Gardens) 1950 : No. 12 : **34–35.** [Russian].

A hardy cherry was obtained in the Ukraine from Francis x Jaboulais. The training consisted of planting stones from the current year's picking in summer.

2120. Richards, B. L.,
Wadley, B. N. and
Cochran, G. W.
New virus disease of sweet cherries found in Utah's Dixie.
Fm Home Sci. Utah 1950 : **11** : **36–37.**

Investigations concerning the Dixie rusty mottle virus disease, which has more serious effects than the necrotic and mild rusty mottle diseases, indicate that all the commercially grown cherries and two varieties of peach, in Washington County, Utah, are susceptible. The reactions of other varieties outside the infected area are being investigated, so that virus resistant material may be obtained.

2121. Nakao, K.
(Breeding experiments with the peach).
Jap. J. Genet. 1942 : **18** : p. 179. [Japanese)].

F_1 peach hybrids have been studied for the consistency and colour of the flesh, appearance of the skin, fruit type, the freestone or clingstone habit, and ripening date.

2122. Peynaud, E.
Sur la composition chimique des pêches. **(On the chemical composition of peaches).**
Ann. Inst. Nat. Rech. Agron., Paris 1950 : **1** : Sér. A : **775–91.**

The attention of breeders is called to the fact that all the 36 varieties forming the main subject of this report differed markedly in chemical composition. Some results of analyses of nine other varieties are also given.

2123. Daines, R. H. and
Hough, L. F.
Artificial inoculation of peach seedlings with *Xanthomonas pruni*.
Phytopathology **1951** : **41** : 8–9. (Abst.).

The majority of seedlings from 19 controlled crosses involving 21 different peach varieties showed symptoms of severe infection 4–6 weeks after inoculation with *Xanthomonas pruni*. Segregation for moderate levels of infection was observed in a few progenies.

2124. Russo, F. and
Torrisi, M.
Forme tetraploidi in *Citrus limon* L. e C. *aurantium* L. (**Tetraploid forms in *Citrus limon* L. and *C. aurantium* L.**).
Ann. Sper. Agrar., Roma 1951 : **5** : 13–20.

Observations in a nursery of sour oranges and on a collection of hybrids in the vicinity of the Acireale Experiment Station for Fruit and Citrus Cultivation led to the identification of some unusual types as tetraploids ($4n = 36$). While the $4n$ sour orange lacks vigour and should not be used as a nursery stock, the tetraploid lemon, crossed with suitable varieties, is useful for obtaining triploids with desirable cultural characteristics.

2125. Batchelor, L. D. and
Cameron, J. W.
Nucellar seedling strains of citrus.
Proc. Fla Hort. Soc. 1949 : 55–65.

Compared with the parent varieties, increased vigour and yields of larger fruits are characteristic of plants grown from nucellar seedlings at the University of California Citrus Experiment Station. Healthy nucellar seedlings have been obtained from plants of the grape fruit variety Ruby, badly infected with psorosis and the lemon variety Eureka showing severe attacks of shell bark disease. Vigorous nucellar strains have also been obtained from the disease-free variety Valencia. The reinvigoration of varieties, including those which have no visible disease symptoms, by using nucellar strains, indicates that the increased vigour results partly from unknown factors other than freedom from disease; this vigour has remained in the nucellar strain of Eureka lemon for 32 years.

2126. Russo, F. and
Torrisi, M.
Il miglioramento delle nostre varietà di agrumi per selezione di forme derivate da embrioni nucellari. (**The improvement of our varieties of *Citrus* by selection of forms derived from nucellar embryos**).
Ann. Sper. Agrar., Roma 1951 : **5** : 5–12.

American work on the production and value of *Citrus* plants derived from nucellar embryos is reviewed; and some account is given of similar research in progress at the Experimental Station for Fruit and Citrus Cultivation at Acireale, Sicily, where varieties of oranges, lemons and mandarins, pollinated in each case by *Poncirus trifoliata*, were used for the experiments; by this means the sexual and agamic progeny could be readily distinguished. The frequency of nucellar bud mutations and their practical value are mentioned; and it is suggested that bud mutations found in plantations should undergo reproduction as nucellar embryos to improve their vigour and productivity and to ensure that they are free from virus disease.

2127.
39th Annual Report of the Northern Nut Growers Association 1948 : Pp. 224.

Quick, R. H. — *The development and propagation of blight resistant chestnut in West Virginia.* (*pp. 26–31*).

The origin and development of blight resistant strains of Chinese chestnut are discussed with particular reference to the yield of nuts as food for game.

Moore, R. C. — *The present status of the chestnut in Virginia.* (*pp. 31–34*).

Since epidemics of blight destroyed the native *Castanea dentata*, commercial production of chestnuts has almost ceased in Virginia. Seedlings of *C. mollissima* vary considerably in resistance to blight and weevils but are generally superior in resistance and nut quality to

C. crenata. Illinois No. 31–4, an intervarietal hybrid of *C. mollissima* with thick burs and closely set spines, is thought to be resistant to weevil attacks.

Jones, G. S. — *Growing Chinese chestnuts in Lee County, Alabama.* (*pp. 34–38*).

The performance of several seedlings of *C. mollissima* at a private orchard in Alabama is reported. The trees were grown from seedlings supplied by the USDA.

Hardy, M. B. — *Chestnut growing in the southeast.* (*pp. 41–50*).

A wide range of tree and nut characteristics exists among trees of *C. mollissima* grown in Georgia. An upright form of growth is common in trees grown from seed obtained in northern China, whereas trees from southern China are usually of a spreading habit, producing larger and more desirable nuts; these differences, in addition to the degree of incompatibility noted in attempted grafting operations, indicate that the upright form may represent a distinct strain. There is a possibility of obtaining progeny exhibiting hybrid vigour by cross-pollinating these two forms.
At the Philema Field Station, three *C. mollissima* seedlings, 7880, 7919 and 7930, have produced nuts of outstanding size, attractiveness and keeping quality; the proposal that they should be given variety status under the respective names Meiling, Kuling and Nanking is being considered by the USDA (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 1135).

Bush, C. D. — *Marketing chestnuts on the Pacific Coast.* (*pp. 51–53*).

Storage and harvesting methods employed in Oregon with European chestnut varieties and Riehl hybrids, having a sweet pellicle, are discussed in relation to the requirements of the trade and consumer.

Gravatt, G. F. and Stout, D. C. — *Diseases affecting the success of tree crop plantings.* (*pp. 60–68*).

The varying degrees of resistance shown by different species and hybrids of (1) *Castanea* to *Endothia parasitica, Gloeosporium* sp. and *Phytophthora Cinnamomi,* (2) *Juglans* to the virus causing brooming disease and (3) *Diospyros* to *Cephalosporium Diospyri* are discussed.

Chase, S. B. — *Round table discussion on chestnut problems.* (*pp. 69–83*).

G. F. Gravatt reports that several blight resistant hybrids from *C. mollissima* x *C. dentata* have been obtained with promising timber qualities; by back-crossing F_1 hybrids with *C. mollissima* for increased blight resistance, the upright form and rapid growth which characterize good timber are lost.
The diversity of opinion in respect of planting either seedlings or grafted stock of *Castanea* is emphasized by H. F. Stoke, J. C. McDaniel and M. B. Hardy. All nurserymen are advised to eliminate *C. crenata* and hybrid forms and to grow pure *C. mollissima* lines for high yields of good quality nuts.

Richards, A. — *Nut trees for West Tennessee.* (*pp. 85–87*).

Descriptive notes are presented on varieties of pecan, walnut, heartnut, filbert and chestnut grown in West Tennessee.

Shadow, W. A. — *Experiences with tree crops in Meigs County, Tennessee.* (*pp. 88–91*).

The performance of varieties of walnut, heartnut, chestnut, persimmon and *Gleditschia* at an orchard in Tennessee is described. A sweet, high yielding strain of Fuyugaki persimmon with resistance to low temperatures, and a walnut giving high yields of hard shelled nuts, with good quality kernels, were found growing wild in woodland adjoining the orchard; the walnut has been named Pineland.

Frye, W. M. — *Nut hobbying in eastern West Virginia.* (*pp. 91–93*).

Varieties of chestnut, filbert, walnut, persimmon and pecan which grow well in areas of Virginia having late spring and early autumn frosts are listed by a private grower.

Tatum, W. G. — *A look "backward and forward" into nut growing in Kentucky.* (*pp. 93–95*).

The advantages of testing varieties for adaptation to certain localities are stressed. Varieties of black and Persian walnut, heartnut, *C. mollissima*, *Carya* spp., *Corylus* spp., *Diospyros* spp. and *Gleditschia* spp. which grow well in Kentucky are described.

MacDaniels, L. H. — *Round table discussion on judging schedule for black walnuts.* (*pp. 95–102*).

Varieties of *Juglans nigra* are discussed in relation to their marketing value in the US.

Davidson, J. — *A picture from our most "northern" member.* (*pp. 102–03*).

Nuts have been obtained from hardy varieties of *Juglans cinerea*, *J. nigra*, *Carya* spp. and *Corylus* hybrids at Brooks, Alb.

Moore, J. C. — *The present outlook for honey-locust in the south.* (*pp. 104–10*).

The characteristics of the *Gleditschia* varieties Millwood and Calhoun are discussed with respect to the protein and sugar content of the pods, pod size, average yield and their use as fodder; by propagating thornless twigs and subsequent selection, thornless stocks of both varieties have been obtained in Alabama. Increased sugar content has been correlated with thornlessness.

Male mutants of a fruiting type of Millwood are reported at Auburn, Ala.; *Gleditschia* is normally a monecious genus.

Overholser, E. L. — *Possibilities of filbert growing in Virginia.* (*pp. 111–15*).

The native *Corylus americana* is being used for breeding purposes in Virginia, to combine its winter hardiness and tolerance of *Cryptosporella anomala* with the superior nut qualities of other species. The F_1 generation of interspecific crosses, using the pistillate parents Rush, Littlepage and Winkler of *C. americana* and pollen from *C. Avellana*, *C. maxima*, *C. Colurna* and *C. heterophylla*, is being tested.

At Beltsville, Md., two new varieties 1667 and 2336 have been produced from *C. Avellana* x *C. americana*. Both varieties have given outstandingly high yields of good quality nuts and have shown marked winter hardiness.

Varieties being grown in Virginia on a hill culture project are listed.

Elliot, N. R. — *Filberts for food and looks in Kentucky.* (*pp. 116–17*).

The varieties Barcelona, DuChilly and Jones Hybrids are recommended for growing together, providing a diversity of foliage and maximum yields of nuts by cross pollination.

Reed, C. A. — *J. F. Jones, introducer of many nut varieties.* (*pp. 118–25*).

The work of J. F. Jones, who died in 1928, is outlined.

Chance, F. S. — *The value of nut trees in Tennessee.* (*pp. 126–29*).

Although *Juglans nigra* has been valued largely for its timber quality in Tennessee, growers are becoming interested in varieties which also yield heavy crops of high quality nuts.

Crane, H. L. — *The development and filling of nuts.* (*pp. 130–39*).

Cross pollination is included in a discussion of factors influencing kernel development. In self sterile species cross pollination is essential but in certain walnut, pecan and hickory

species, which are self fertile, dichogamy restricts self pollination; thus cross pollination is necessary. In all species cross pollination produces a better nut and larger kernel than self pollination. Intervarietal pollination in the chestnut and pecan has resulted in hybrid vigour.

Clarke, W. S. (Jun.). *Nut investigations at the Pennsylvania State College.* (*pp. 148–49*).

Tests of varieties of many different nuts are continuing at the Pennsylvania State College.

McCauley, F. J. *Marketing black walnut kernels.* (*pp. 152–57*).

The characteristics of varieties of *J. nigra* and *J. Hindsii* are described with respect to the preferences of the consumer.

Cross, F. B. *Pecan selection in Oklahoma.* (*pp. 160–64*).

Seedlings are being evaluated to find trees which are more satisfactory than the available commercial varieties.

Magill, W. W. *A pecan improvement program for southwestern Kentucky.* (*pp. 164–66*).

The performance of several outstanding native trees is described; it is hoped that scion wood will be obtained from them to develop grafting wood. Several hardy northern varieties have proved suitable for this region which approaches the northern limit for growing southern varieties successfully.

Senn, T. L. *Pecan production in South Carolina.* (*pp. 167–69*).

Commercially grown varieties well adapted to South Carolina are described. Improved varieties rather than seedlings are recommended for high yields of good quality nuts.

Sherman, L. W. *Follow-up studies on the 1946 Ohio black walnut prize winners.* (*pp. 174–77*).

The susceptibility of several superior varieties to low temperatures has indicated that they are adapted to the southern rather than the northern part of Ohio.

Deming, W. C. *Odds and ends.* (*p. 181*).

Crossing a late flowering ornamental horse chestnut, *Aesculus parviflora*, which bears a nut entirely free from bitterness, with common bitter species is suggested as a method of obtaining nuts which can be used as fodder.

Winkleman, T. A. *Marketing of black walnuts in Arkansas.* (*pp. 183–84*).

Varieties of *J. nigra* are discussed with respect to their marketing value.

Hopkins, S. L. *A pecan orchard in Gloucester County, Virginia.* (*pp. 186–88*).

A description of the yields obtained at an orchard in Gloucester County, Va., indicates that many varieties from the north and south give consistently poor crops.

Weschcke, C. *The importance of stock and scion relationship in hickory and walnut.* (*pp. 190–95*).

The hickory varieties Bridgewater and Weschcke are recommended for commercial production. A detailed description of Weschcke, which is male sterile, emphasizes its resistance to frost, weevil attacks and diseases and its high productivity. The thinness and smoothness of the shell are indications of its hybrid nature.

Lahti, M. *Progress with nuts at Wolfeboro, New Hampshire.* (*pp. 195–96*).

The progress of varieties of walnut, heartnut, butternut, hickory, chestnut and filbert which have survived the severe winters is described.

Szego, A. — *Breeding chestnuts in the New York City area.* (*pp. 196–99*).

Chestnut breeders are criticized for crossing inferior material, using any individuals of the required species that are flowering simultaneously. Numerous *C. dentata* seedlings with strong blight resistance have reached heights of 9–20 feet. These are to be crossed with *C. Seguinii* for greater blight resistance and productivity, with the variety Abundance of *C. mollissima* for vigorous growth, good timber quality, blight resistance and fine nuts of medium size, and with varieties of *C. crenata* for high yields of medium sized nuts.

MacDaniels, L. H. and Boynton, D. — *Winter injury to nut trees at Ithaca, New York, in the fall and winter of 1947–48.* (*pp. 199–201*).

The losses of nut trees in New York during the exceptionally hard winter indicated the incompleteness of the information regarding the reaction of varieties to low temperatures. New varieties of greater hardiness or with early maturity and consequent immunity from early frost damage are needed.

Corsan, G. H. — *What came through the hard winter in Ontario.* (*pp. 201–02*).

Varieties of Persian walnut, black walnut, filbert and butternut x heartnut hybrids which survived the low winter temperatures are listed.

Collins, J. N. — *Filberts grow in Vermont.* (*pp. 202–03*).

Selected varieties of filbert can be grown successfully in the northeastern area. Although hybrids between the American and European filbert produce high yields the nut flavour is inferior to that of pure *C. Avellana.*

Report of necrology committee. Schuster, C. E. (*p. 203*).

A short obituary contains reference to the work of C. E. Shuster at Oregon State College in connection with filbert and walnut production.

2128.

40th Annual Report of the Northern Nut Growers Association 1949 : Pp. 206.

Silvis, R. E. — *Report of the survey and research committee. Part I. Nut crop survey.* (*pp. 26–30*).

A survey of nut varieties in the US has been instigated; the list, to date, is presented, showing the number of varieties grown in each state and the weight in pounds produced by every species per year.

Hershey, J. W. — *Acorns—the mountain corn crop.* (*pp. 39–43*).

Breeding work with oak is reported; the aims are an upright stature, for timber quality, combined with high productivity of sweet, worm-free acorns. Species of oak recommended for general planting to provide sweet acorns for pig and poultry food are *Quercus Muhlenbergi, Q. montana* and *Q. Prinus.* The possibility of introducing these sweet acorns for culinary purposes is discussed.

Weschcke, C. — *Will the hickory become a commercial nut like the pecan?* (*pp. 54–58*).

The characteristics of different varieties of hickory are discussed with reference to the requirements of the consumer.

MacDaniels, L. H. — *A possible scoring schedule for hickories.* (*pp. 58–62*).

The desirable characteristics expected in a good variety of hickory are discussed; several varieties are listed in order of preference based on these criteria.

Chase, S. B. — *The performance of Persian walnut in eastern Tennessee.* (*pp. 64–71*).

Although all the 34 varieties of Persian walnut being used for trials in the eastern Tennessee valley are supposedly hardy, the low spring temperatures continue to damage the flowers so that very few nuts are produced each year.

"What is the future of the Carpathian walnuts?" (*pp. 71–85*).

The performance of Carpathian walnut varieties was compared with numerous other varieties in a discussion involving growers from widely scattered localities.

Graves, A. H. — *Chestnut breeding work. Report for 1948 and 1949.* (*pp. 85–94*).

Several vigorous blight resistant hybrids have been obtained at the Connecticut Experiment Station from crosses of *Castanea mollissima* with hybrids of *C. crenata* x *C. dentata*; nut crops from the progeny have not been outstanding, but further breeding is in progress. Additional crosses of these blight-free hybrids are being made with the following: *C. mollissima* x *C. dentata*, *C. dentata* x *C. mollissima*, blight resistant forms of *C. dentata* and tall genotypes of *C. mollissima*. Several individuals from these crosses have proved valuable for nut production.

In conjunction with the Italian government, pollen from *C. sativa*, growing in Italy, has been imported for crosses with hybrids at the station; nuts, scions and pollen of blight resistant hybrids are being sent to Italy and France.

Graves, A. H. — *Key to chestnut species with notes on some hybrids.* (*pp. 95–107*).

Using leaf characters as the main diagnostic features of the species, a useful key has been devised; this is followed by short descriptions of the various species and brief notes on a few hybrids.

Chase, S. B. — *Winners in 1949 Persian walnut contest.* (*pp. 115, 182–83*).

Among the prize winning varieties of Carpathian walnuts are two North European strains, Nos. 50 and 60, selected by S. M. Shessler in northern Ohio; these have been named, respectively, Jacobs and Hansen.

Hardy, M. B. — *The propagation of Chinese chestnuts.* (*pp. 121–30*).

A discussion of the methods of propagating *C. mollissima* in Georgia includes the production of homozygous seedlings of *C. mollissima* from controlled pollinations; these seedlings, rather than interspecific hybrids, are recommended for nut production.

Hammar, H. E. — *Harvesting and storing Chinese chestnuts.* (*pp. 130–35*).

The results of storage and germination tests show that nuts from individual seedlings or clonal varieties grown in Georgia vary considerably in their keeping quality.

McKay, J. W. — *Certain techniques used in breeding work with nut trees.* (*pp. 152–54*).

Techniques employed at the Plant Industry Station, Beltsville, Md, to induce seedlings to bear several years sooner than under normal conditions, are described. Isolated plantings of two self sterile varieties are recommended as a method of obtaining cross-pollinated progenies of which both the male and female parents are known.

Slate, G. L. — *Persimmons, a promising neglected fruit.* (*pp. 154–57*).

Several early maturing persimmon varieties growing well at Geneva, NY, are described and recommended for trials further north.

Chase, S. B. *The dwarfing effect of* Juglans rupestris. (*pp. 158–60*).

Tests in the Tennessee valley of the performance of *J. rupestris* and *J. nigra* as rootstocks for varieties of black walnut show that all varieties grown on *J. rupestris* are dwarfed.

"The future of the black walnut industry." (*pp. 160–70*).

The relative productiveness and nut quality of many varieties of *J. nigra* grown in widely scattered localities are discussed.

Graham, S. H. *Central New York notes.* (*p. 171*).

Individual trees of Carpathian walnut strains growing in New York vary in respect of the times of leaf emergence, leaf abscission, blossoming, shedding of pollen in relation to the period of receptiveness of the stigmas and in hardiness and percentage of nut setting under apparently uniform environmental conditions.
Filbert hybrids which have proved blight resistant include Winkler hybrids and individuals of Rush x Riesennuss parentage.

Corsan, G. H. *Echo Valley report, 1948–49.* (*pp. 176–77*).

Varieties of filbert which have given high yields in the Echo valley, Ont, are recommended for their hardiness.

2129. Graves, A. H.
Relative blight resistance in species and hybrids of *Castanea*.
Phytopathology 1950 : **40** : 1125–31.

Information is given on the reaction of *Castanea* species and hybrids to *Endothia parasitica*. Among the species only the Chinese chestnut (*C. mollissima*) is classed as very resistant; an accession of *C. Seguini* is rated as resistant, only slight growth of the fungus occurring after inoculation. Breeding work has indicated that resistance to *E. parasitica* depends upon more than one gene pair and that it may be linked with other characters. The crosses *C. mollissima* x *C. Seguini*, (*C. mollissima* x *C. Seguini*) x Japanese chestnut (*C. crenata*) and *C. mollissima* x Japanese-American hybrid have yielded individuals in the very resistant and resistant groups. Other crosses have produced trees graded as resistant or moderately resistant.

2130. Pires, F. F.
Notas sobre a cultura do amendoim. (**Notes on the cultivation of the groundnut**).
Gaz. Agric., Lourenço Marques 1950 : **2** : 262–68.

Descriptions are given of the varieties, including local types, of groundnut grown in Moçambique.

2131.
Reuniéronse en Manfredi los técnicos del maní y girasol. (**The meeting of groundnut and sunflower experts at Manfredi**).
Inform. Invest. Agríc. (IDIA), B. Aires 1950 : **3** : No. 33–34 : 2–7.

The following information on Argentine and Uruguayan work on the groundnut and sunflower is of interest to plant breeders:—

Groundnut
Arachis pusilla has $2n = 40$ chromosomes. Evidence has been obtained in the cross *A. villosa* var. *correntina* ($2n = 20$) x *A. hypogaea* of genomic affinity between these two species, though the F_1 hybrid is sterile. *A. villosa* is of interest on account of its resistance to diseases and its vigour.
The lack of colour in the testa of the variety Guaycurú is determined by a single colour-inhibiting factor.

The variety Guaycurú is being used in an attempt to incorporate resistance to premature germination in commercial types. Two promising selections of white groundnut for oil extraction are mentioned.
Experiments are being made to see whether creeping varieties can be developed for countering soil erosion.
Information is provided on the two main unimproved groundnut types grown in Argentina, the white seeded oil type and a type with a coloured testa grown for direct consumption around Córdoba.

Sunflower
Methods of producing synthetic varieties and heterotic hybrids are discussed.
Although some varieties are tolerant of virus infection, no true resistance has been discovered. The resistance of some wild and decorative species was not passed on to their hybrids with commercial types.
Breeding is in progress for resistance to *Sclerotinia* and for suitability for ensilage.

2132. Šmargonj, È. M.
[The biology of fertilization in the groundnut (*Arachis hypogaea* L.)].
Bot. Ž. (Bot. J.), Kiïv **1949** : **6** : No. **3** : 34–40. [Ukrainian].

Embryological studies with the groundnut are reported. The embryo of *Arachis* was found to have a special method of absorbing the sugars which flow from the leaves to the region of the micropyle. The rudimentary nature of the endosperm is explained by the exclusion of foreign pollen from double fertilization. All flowers are regarded as fertile, and the view that *Arachis* produces sterile chasmogamous flowers is described as harmful to agricultural practice.

2133. Jarry-Desloges, R.
Les *Carica quercifolia* hybrides. **(*Carica quercifolia* hybrids).**
Rev. Hort., Paris **1950** : **122** : p. 299.

The writer, who regards *C. quercifolia* and *C. hastaefolia* as distinct species, records an attempt, by selection and cross pollination at Menton and later at Pau, to raise seedlings combining large fruits with good flavour. Some promising plants obtained were lost, but some good seed was saved and the work is being continued. He found male plants to be more vigorous than the female ones and, in contrast to American findings, the sexes occurred in about equal numbers.

2134.
Berries for home use.
Amer. Nurserym. **1950** : **102** : No. **10** : 65–66.

The raspberry Amber and strawberry Essex (NY 7225) have been introduced by the New York State Agricultural Experiment Station. Amber, produced from a cross between Taylor and Cuthbert, ripens late; its fruits are large, yellowish orange, sweet and of good quality; the variety has shown little winter injury. Essex, from a cross between Howard (Premier) and Deutsch Evern, ripens five to seven days earlier than Howard. It is recommended for domestic gardens, but not for commercial planting on account of its medium size and susceptibility to bruising.

2135. Wilhelm, S. and
Thomas, H. E.
***Verticillium* wilt of bramble fruits with special reference to *Rubus ursinus* derivatives.**
Phytopathology **1950** : **40** : 1103–10.

Clones of the Pacific Coast trailing blackberry (*R. ursinus*) and its derivative commercial varieties Logan, Mammoth and Cory Thornless exhibit a highly tolerant or immune reaction

to *V. albo-atrum.* In addition, *R. procerus*, *R. laciniatus*, *R. ulmifolius* var. *inermis* and probably *R. procumbens* are tolerant or immune. The horticultural varieties Boysen, Nectar and Young, also derived from *R. ursinus*, and *R. parviflorus* and *R. allegheniensis* have proved susceptible. Seedlings of Boysen, Nectar and Young segregate for susceptibility and resistance; Logan appears to breed true for resistance. Small numbers of the F_1 progenies of the crosses Logan x Lloyd George raspberry (susceptible) and Boysen x Himalaya (*R. procerus*) were resistant to *Verticillium* wilt.

2136. Sortsforsøg med hindbær 1938–48. (**Variety trials with raspberries 1938-48**).
Tidsskr. Planteavl 1950 : **54** : 152–55.

The performance of Danish and other varieties at various experimental stations in Denmark is recorded. Though the Danish varieties Spangsbjerg 140 (Fajstrup x Marlboro 1925) and Spangsbjerg 8 (Fajstrup x Lloyd George 1929) were surpassed by Preussen and Lloyd George in yield, they are to be retained for further tests as both are specially suitable for freezing or syrup production.

2137. Morrow, E. B. and
Darrow, G. M.
The Murphy and Wolcott blueberry varieties.
Spec. Circ. N.C. Agric. Exp. Sta. 1950 : No. 10 : Pp. 7.

Detailed descriptions are given of the new canker resistant blueberries Murphy and Wolcott (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2615). Both varieties resulted from the cross Weymouth x F–6 (Stanley x Crabbe 4); canker resistance was derived from Crabbe 4, a wild selection from eastern North Carolina. Both Wolcott and Murphy equal Weymouth in yielding capacity and berry size. Wolcott is as early as the latter variety. Murphy, which bears a particularly good type of cluster, is earlier than either June or Stanley.

2138. Hržanovsjkiĭ, V. G.
(**Wild roses of the Transcarpathian province of the Ukrainian SSSR**).
Bot. Ž. (Bot. J.), Kiïv 1949 : **6** : No. 1 : 58–73. [Ukrainian].

Latin and Ukrainian descriptions of two new species, *Rosa heterostyla* and *R. minimalis*, and several new botanical varieties of wild rose, are given.

2139. Johansson, E.
Indra—en ny jordgubbssort från Alnarp. (**Indra, a new strawberry from Alnarp**).
Sverig. Pomol. Fören. Årsskr. 1950 : **51** : 237–40.

In the course of strawberry breeding at Alnarp, the new variety Indra has been obtained from a cross of an American variety, called Southland in Sweden, with the Swedish variety Luna. Indra, a medium early variety, has bright red, juicy, sweet fruits with an aromatic flavour and is therefore more suitable for dessert than preserving. The plants are vigorous and give good yields, though, like the ♀ parent, they tend to produce small fruits towards the end of the harvest.

2140. Kronenberg, H. G.
Veredeling van aardbeien. (**Strawberry breeding**).
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) 17 February, 1949 Wageningen : 268–83. (Mimeographed).

Selection is carried out within existing varieties for purity, health and fertility; a start is being made in testing for virus infection.

Wild varieties are briefly described and chromosome numbers recorded. Although crosses between varieties with differing chromosome numbers rarely set, the fertile hybrid *Fragaria elaticollina* was obtained by crossing the hexaploid *F. elatior* and the diploid *F. collina.* Likewise the tetraploid *F. elnipponica* from *F. elatior* and *F. nipponica* gave a large number of F_1 plants. In recent years there has been much work on colchicine treatment of seed or, preferably, root tips. In this way a tetraploid was obtained from the diploid wood strawberry, and this was crossed with octoploids, whence hexaploids and eventually a septaploid were obtained. In Sweden, triploids and tetraploids have been obtained from diploids in this way.

At the Plant Breeding Institute in Holland there are two widely differing types of *F. virginiana,* one of which appears to be a source of resistance to night frosts. Strains of *F. chiloensis* provide strong growth and resistance to red root rot and fairly strong tolerance of virus. They flower late and often introduce sterility and poor quality fruit. *F. ovalis* (triploid) is resistant to extreme cold and drought.

Desirable characters in breeding are discussed. Low fertility may be due to the state of the stigmata, especially of the later flowers of a truss, or to an insufficiency of good pollen. Fruits should be large, regular, not too soft, and of good colour, flavour and aroma. Reasonable resistance is desirable towards diseases such as leaf spot, mildew, root rot and virus. Deutsch Evern has been the earliest Dutch strawberry so far but König der Frühen [King of the Earlies] is earlier. Crossing early varieties usually leads to greater earliness. Resistance to night frost is found in the varieties Fairmont and Sheldon of *F. virginiana.* Hybrids of these show higher resistance and greater variability than either parent. Winter hardiness depends on wind strength as well as temperature. Plants on wet sandy soil freeze less readily than those on dry sands or clay. Varieties from latitude 30° will show unusually strong vegetative growth in Holland, but fertility may be slight. Deutsch Evern is definitely less susceptible to *Verticillium* than Jucunda and others. Outstanding resistance is found in Boyes's Cambridge seedlings. No definite resistance to canker or eelworm is known. Great variation in vitamin C content occurs between varieties and even within them and the contents of many varieties and crosses are tabulated.

Improved substitutes for Jucunda and Montot are desirable, as is a stronger form of Deutsch Evern.

2141. Voluznev, A. G.
(Novinka Belorussii*, an interspecific *Fragaria* hybrid).
Sad i Ogorod (Fruit and Vegetable Gardens) 1950 : No. 12 : 66–67. [Russian].

At the White Russian Fruit and Vegetable Research Station, direct and reciprocal interspecific crosses were made between large fruited strawberry varieties, including Marshall and Roščinskaja, on the one hand, and Milanskaja [Milan] on the other. In crosses involving Milanskaja as a female parent most hybrids were of the Milanskaja type. Plants with intermediate characters either failed to bloom or to set fruit, and when they flowered and set fruit developed only a few deformed fruits.

Direct crosses between the large fruited strawberries and Milanskaja however gave several hybrids with intermediate characters and good fruit set. The most promising hybrids were selected from Marshall x Milanskaja and Roščinskaja x Milanskaja. The hybrids were trained upon good soil and the most productive plants were reproduced by cuttings.

Novinka Belorussii was derived from the highest yielding individual, designated 1–4–122. It is a vigorous and hardy variety with perfect flowers and fruits of good flavour.

Breeding work with some of the hybrid material is being continued, the methods being free cross pollination and back crosses. Some of these hybrids have borne fruits of very sweet flavour and possess other good characters.

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* Novelty of White Russia.

2142. Šaškina, L. M.
(Cross pollination of the strawberry).
Agrobiologija (Agrobiology) 1950 : No. 5 : 45–47. [Russian].

Pollinating varieties for strawberries cultivated in the Moscow province are discussed. Pionerka [Pioneer] proved a good pollinator for the pistillate varieties Komsomolka [Komsomol] and Obiljnaja [Abundant] and for several varieties with perfect flowers. Some results of experiments with pollen mixtures are reported. It was found that the fruit setting in Krasavica Severa [Beauty of the North] was improved when pollen of Pionerka and Negritenok [Piccaninny] was added to self pollen, while the admixture of pollen of Pionerka and Mysovka [Bay] to self pollen of Negritenok impaired the fruit setting capacity of the latter. The pollen of each pollinating variety, applied separately, resulted in good setting.
Size of fruits was found to be determined by the male as well as the female component in the crosses. Krasavica Zagorjja [Ultramontane Beauty] yielded large fruits when it was pollinated with self pollen + Pionerka pollen. As a result of cross pollination with Negritenok, Krasavica Zagorjja produced fruits half their normal size. This effect upon fruit size of the pollen of Negritenok was observed also on other varieties.

2143. Reid, R. D.
Breeding strawberries resistant to disease.
Ann. Appl. Biol. 1951 : **38** : p. 306. (Abst.).

A brief survey is given of strawberry breeding primarily for resistance to red core, carried out at the West of Scotland Agricultural College, Auchincruive (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2144).

2144. Braun, A. J.
***Verticillium* wilt now recognized as a destructive disease of strawberries in New York State.**
Phytopathology 1951 : **41** : p. 4. (Abst.).

Variations are recorded in the reaction of commercially grown strawberry varieties to *Verticillium* wilt.

2145. Demaree, J. B. and
Marcus, C. P.
Strawberry viruses in eastern United States, as expressed when transmitted to *Fragaria vesca*.
Phytopathology 1951 : **41** : p. 10. (Abst.).

The reactions of *F. vesca* plants, on to which 53 strawberry varieties and selections with virus infections were grafted, have been used to group the viruses into three distinct classes, designated tentatively as virus 1, 2 and 3. Details of each class of symptoms appearing on the *F. vesca* indicators are recorded.

2146.
Three new cranberries are excellent keepers, tests show.
Crops and Soils 1951 : **3** : No. 6 : p. 31.

Mention is made of the new varieties Stevens, Wilcox and Beckwith, developed jointly by the US Department of Agriculture and New Jersey Agricultural Experiment Station. All three varieties are highly productive and bear larger berries than the chief commercial cranberries now cultivated in the northeastern United States; in storage tests they have shown outstandingly good keeping qualities.

2147. Harper, J. L.
Studies in the resistance of certain varieties of banana to Panama disease. Part I. Internal factors for resistance and antibiotics.
Plant and Soil 1950 : **2** : 374–82.

No evidence has been obtained of the existence in the roots or rhizomes of several banana varieties studied in Trinidad, of any stable toxic substance which prevents the growth of *Fusarium oxysporum-cubense*, causing Panama disease. Equal growth of the pathogen was supported by discs of living tissue and media prepared from the rhizomes of resistant and susceptible varieties including Gros Michel, Congo, Silk Fig, Guindy, IC 1 and IC 2. Alcoholic extracts from banana roots showed only ephemeral antibiotic activity against *F. oxysporum-cubense*; varietal differences in the quantity and type of antibiotics produced were not correlated with disease resistance.

2148. Harper, J. L.
Studies in the resistance of certain varieties of banana to Panama Disease. Part II. The rhizosphere.
Plant and Soil 1950 : **2** : 383–94.

Quantitative differences were observed in the rhizosphere flora of potted banana suckers of Gros Michel, Congo, Silk Fig and Guindy. Varieties susceptible to *Fusarium oxysporum-cubense* supported a higher number of microorganisms than a genetically allied resistant variety. A bacterium strongly antagonistic to *F. oxysporum-cubense* was isolated in high numbers from the rhizosphere of the immune variety Congo, but was present in only negligible numbers from the susceptible Gros Michel.

2149. Collins, J. L.
Notes on the origin, history and genetic nature of the Cayenne pineapple.
Pacific Sci. 1951 : **5** : 3–17.

The origin and history of the pineapple variety Cayenne are discussed; three existing strains and numerous somatic mutations are described and classified. In one mutant form self incompatability, characteristic of the variety, is replaced by self fertility, controlled by a dominant factor. Many inbred progeny from this self fertile type die in the seedling stage, having inherited semilethal factors, others show great weakness and slow growth rates, with wide variations in plant and fruit characteristics. These phenomena indicate that the variety Cayenne is highly heterozygous and that it exhibits hybrid vigour; evidence regarding its parentage suggests that unknown varieties of *Ananas comosus* or some other unknown species were involved. The chromosome number of $2n = 50$ has been multiplied by colchicine treatment to give tetraploids in which $2n = 100$, but the tetraploids have many inferior characteristics.

2150. Sedláček, J.
Praktické zkušenosti s pěstováním révy vinné. **(Practical achievements in viticulture).**
Věstn. Čsl. Akad. Zeměd. 1950 : **24** : 540–46.

At a viticultural conference of the Czechoslovakian Agricultural Academy in 1950 measures to improve the productiveness of Czechoslovakian vineyards were discussed. Breeding work with scion varieties should be limited to varieties which have proved their economic value. Continued vegetative reproduction caused partial deterioration of such varieties as Rylink Rýnský, Burgundské Modre [Blue Burgundy], Burgundské Bílé [White Burgundy], Burgundské Šedí [Grey Burgundy], Chrupky, Frankovka and Furmint. Mass and individual plant selection methods are described.
Extensive notes on the choice of rootstocks include a list of varieties immune from or resistant to *Phylloxera*. They are Riparia Portalis, Riparia x Rupestris, Berlandieri x Riparia, Rupestris Metallica, Solonis x Riparia, and Chasselas x Berlandieri.

2151. Makarov-Kožuhov, L. N.
(The hybrid plant material of the Anapa Research Station).
Vinodelie Vinogradarstvo SSSR (Wine-making Viticult. USSR) 1950 : No. 11 : 49–50. [Russian].

A large number of promising hybrid vines were obtained at the Anapa Research Station by wide crossing and Mičurinite selection methods.
The most productive hybrids were from the crosses Aligoté x Muskat Aleksandriĭskiĭ [Alexandria Muscat], Čauš x Muscat de Hambourg, Puhljakovskiĭ x Muscat de Hambourg and Tavriz x Muscat de Hambourg. The sugar content of the grapes of these hybrids was higher than that of the initial varieties.
The material selected for trials in 1950 consisted of 93 promising hybrids; only 2 selfed seedlings possessed good economic properties. The hybrids comprised 50 varieties for wine making, 40 varieties grown for dessert and 5 varieties suitable for various economic purposes.
Brief notes on some of the hybrids are given.

2152. Boubals, D. and
Huglin, P.
Étude de l'incompatibilité au greffage de certains cépages et du 57 R.
(A study of incompatibility in grafting of certain vines and of 57 R).
Progr. Agric. Vitic. **1950 : 67** : 183–89.

The authors' observations on grafts of Jaoumet on 57 R direct, or double worked on Rupestris du Lot or Aramon, can, they think, be readily explained on the basis of D. Kostoff's antibody theory which he formulated from experiments on acquired immunity in plants.
The antibody theory may be applied later to interpret work in progress on the pollination of ovules of 57 R by Jaoumet pollen and on the mode of inheritance of incompatibility between scion and stock.

2153.
Franco-American grapes.
Amer. Nurserym. 1950 : **92** : No. 11 : p. 52.

Hybrid varieties between American and French grapes introduced from Europe into New York State are showing promise. At the Agricultural Experiment Station, Geneva, cultural tests of these varieties have been completed; study of suitability for wine making and dessert is now in progress. The most promising hybrids for white wine are Ravat 6, Seibel 4986, Seibel 9110, Seibel 10868, Seibel 13047 and Seyve-Villard 14287. Among the red wine grapes work is being concentrated upon Baco 1, Seibel 1000, Seibel 5898, Seibel 6339, Seibel 7053 and Seibel 10878. All these varieties are usually high in acidity and sugar content.

2154. Negrulj, A. M. and
Rubin, S. M.
(The viticultural scientific research institutes on the thirty-third anniversary of the October revolution).
Sad i Ogorod (Fruit and Vegetable Gardens) 1950 : No. 11 : 26–29. [Russian].

Several productive, hardy vines with short growth periods for cultivation in the Soviet Far East and northern Russia have been developed at the Ussuri Fruit Research Station. They are Daljnevostočnyĭ Tihonova [Tihonov's Far Eastern], Taežnyĭ Izumrud [Taĭga

Emerald], a seedling from *Vitis riparia* x *V. Labrusca*, Belyĭ Suputinskiĭ [White Suputinskiĭ], from (*V. amurensis* x *V. vinifera*) x (*V. riparia* x *V. Labrusca*), Daljnevostočnyĭ Ramminga [Ramming's Far Eastern], from (*V. amurensis* x *V. vinifera*) x (*V. riparia* x *V. Labrusca*), and Šasla Ramminga [Ramming's Chasselas], from (*V. amurensis* x *V. vinifera*) x (*V. Labrusca* x *V. vinifera*).

At Brjansk, an early hybrid, Sejanec Safaĭlova [Safaĭlov's Seedling), producing sweet grapes under Moscow conditions in August, was developed, and at Mičurinsk, the varieties Zarja Severa [Dawn of the North] and Severnyĭ [Northern], possessing similar properties as Sejanec Safaĭlova, were bred from Sejanec Malengra [Malingre Seedling] x *V. amurensis*.

The new varieties obtained at the Baškirian Fruit Station include Jubileĭnyĭ [Jubilee], from Madeleine Angevine x Malengr Rannii [Early Malingre], Sejanec Streljaevoĭ [Streljaeva's Seedling], from Madeleine Angevine x a pollen mixture, Baškirskiĭ Rozovyĭ [Pink Baškirian], from Senso x Rupestris, Baškirskiĭ Rannii [Early Baškirian], from Madeleine Angevine x mixed pollen, Baškirskiĭ Černyĭ [Black Baškirian], from Madeleine Angevine x Buĭtur, and Dekorativnyĭ [Ornamental], from Madeleine Angevine x Ampelopsis.

Reference is made to promising seedlings of Mičurin vines and hybrids from crosses involving *V. amurensis*, which have been obtained at the Timirjazev Agricultural Academy and at the Magarač Institute.

Several varieties developed at the Central Asiatic Station of the USSR Institute of Plant Industry have been made standards for the Uzbek SSR. Pobeda [Victory] is a mid-season dessert variety with large attractive black grapes. Its bunches weigh 700 grm. Under Uzbekistan conditions the variety yields 300 c. per ha. The transportability of the grapes is good. Rannii VIR'a [Early VIR*] is a good dessert variety. Muskat Uzbekistanskiĭ [Uzbekistan Muscat] is a dessert variety yielding 450 c. per ha. The bunches weigh 608 grm. each. The grapes are greenish yellow and have a muscat flavour. The new varieties for wine making include Muskat VIR'a [VIR Muscat] and VIR-1, of which the former is described as a mid-season productive variety with dark red grapes having a high sugar content and muscat flavour. All these varieties are being extensively cultivated in the Uzbek SSR, while Pamjatj Mičurina [Mičurin's Memorial], from Muskat Aleksandriĭskiĭ [Alexandria Muscat] x *V. amurensis*, and Pozdniĭ Negrulja [Negrulj's Late] will probably be made standards. The former is a hardy variety suitable for making heavy red wines and the latter a late dessert variety with grapes of good transportability.

Mention is made of promising varieties bred at Novočerkassk, Samarkand, Dagestan, the Altaĭ and the Armenian SSR.

Breeding vines for resistance to *Phylloxera* and other diseases is reported at the Magarač Institute in Yalta and its branches elsewhere in the USSR. Two new varieties, for making wines, Magarač 217, from Bastardo x Saperavi, and Ivanovskiĭ, from Bastardo x Muscat de Hambourg, were developed at Yalta.

At the Ukrainian Institute of Viticulture and Wine Making several vines resistant to *Phylloxera* and fungous diseases were obtained and highly productive clones of Rkaciteli, Saperavi, and Citeli-Budešuri selected.

At the Kirovabad Research Station hybrid vines with male flowers producing large amounts of pollen were obtained. These forms bear many inflorescences and make good pollinators of the varieties with female flowers.

FORESTRY

2155.

News of the World. Germany.
Unasylva 1950 : **4** : p. 181.

A working group on forest genetics and plant breeding has been created in Germany. Its aims include the advancement of knowledge on all aspects of forest tree breeding, coordination of experiments and dissemination of results for practical purposes.

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* Vsesojuznyĭ Institut Rastenievodstva [USSR Institute of Plant Industry].

2156.

Berättelse över verksamheten vid statens skogsforskningsinstitut under år 1949. **(Report on the work of the National Forestry Research Institute during the year 1949).**
Medd. Stat. SkogsForskInst., Stockh. 1951 : **39** : No. 6 : Pp. 18.

A special joint committee to promote research on the breeding and genetics of forest trees in Sweden was formed during the year; it consists of representatives from the Forestry Research Institute, the Association for Forest Tree Breeding, the Society for Practical Forest Improvement, and other Swedish bodies.
Brief mention is made of the following research in progress on hybridization and inbreeding of *Pinus sylvestris* for which the preliminary preparations for artificial pollinations have been undertaken in five different geographical regions; the work includes crosses of fine-branched, narrow-crowned trees of high quality and vigour with coarse-branched, broad-crowned, inferior trees from the same stand.
Hybridizations have also been carried out between species and between trees of different provenance and some inbreeding experiments have been made. Similar work at Åkersberga with spruces is mentioned.
A register of high grade trees has been begun.

2157. Hart, C. E.
Forest tree breeding.
Quart. J. For. 1951 : **45** : 16–22.

A general account of the progress made in applying genetical principles to forestry includes a description of the work of C. Syrach Larsen at the Arboretum, Høsholm, and the Krogerup Plant Breeding Station, Denmark. At Høsholm, present work includes: (*a*) the development of a rust resistant aspen for match wood from the cross *Populus tremula* x *P. tremuloides*; (*b*) production of a quick growing larch, with fine branching, from a Japanese larch strain which will be crossed with strains of either European or Polish origin; (*c*) the production of a strain of *Thuja plicata* resistant to *Keithia thujina*; and (*d*) seedling tests of birch and alder to find those suitable for afforestation schemes in Greenland. At Krogerup new hybrids of *Larix* are being developed from controlled pollinations. Diecious trees of ash are being grown in a seed source plantation comprising double rows of each of 13 female clones interspersed with rows of a single male clone; the progeny are expected to show the characteristics of the male parent in 13 different combinations.

2158.

Forest research in India and Burma 1947-48. Part I. The Forest Research Institute.
Dehra Dun 1950 : Pp. 133.

The work of the Forest Research Institute, Dehra Dun, is reported. Among many data are the results of natural and artificial regeneration experiments with numerous species. Plantations of *Acacia Catechu, Schleichera trijuga* and *Butea frondosa* of different origins have been maintained for investigating the inheritance of climatic and physiological characters.
It has been observed that while all the fruits of *Aleurites Fordii* ripen and fall simultaneously those of *A. montana* fall in batches; the total fruit yields are recorded as $7{\cdot}4 \pm 0{\cdot}59$ seers and $9{\cdot}29 \pm 1{\cdot}88$ seers respectively.

2159. Brink, R. A.
A prospective view of forest-tree breeding in Wisconsin.
J. For. 1949 : **47** : 813–18.

The need for more research in forest tree genetics is emphasized, with an analysis of the difficulties involved. In the proposed plan are included (1) the improvement of the genetic quality of seed, (2) selection of superior trees by testing clonal and seed progeny, and (3) the development of improved strains.

2160. SCHREINER, E. J.
Genetics in relation to forestry.
J. For. 1950 : **48** : 33–38.

The development and present status of forest tree breeding and genetics in the USA are summarized. Improvements in a wild stock are possible after many years of selecting outstanding varieties and individuals, selective breeding between such types and production of new forms by hybridization using natural or induced differences in chromosome numbers. The future of hybridization is discussed with particular reference to hybrid vigour.

2161. DUNCAN, W. H.
***Quercus oglethorpensis*—range extensions and phylogenetic relationships.**
Lloydia, Cincinnati 1950 : **13** : 242–48.

The distribution of *Q. oglethorpensis* in Georgia and South Carolina is surveyed. The view is expressed that this oak is a relic species. The possible phylogenetical relationships of *Q. oglethorpensis, Q. breviloba, Q. Durandii, Q. Margaretta, Q. austrina, Q. alba, Q. Chapmanii* and *Q. stellata* are indicated.

2162. WRIGHT, J. W.
Local genetic variation in silver maple.
J. For. 1949 : **47** : 300–02.

An experiment with open-pollinated seed of wild *Acer saccharinum* individuals from different localities in Indiana indicates that there are distinct genetic differences between trees in a limited area. Having determined branchiness by estimating the number of branches developing in the axils of uninjured leaves on the current year's growth, progenies were separated into three biotypes: (1) a very winter hardy, branch-free type, (2) a moderately winter hardy, branch-free type, and (3) a non-hardy, branchy type. Such differences indicate the possibility of obtaining some degree of hybrid vigour from crosses between distinct biotypes.

2163. BLOW, F. E.
Hybrid poplar performance tests in the Tennessee Valley.
J. For. 1948 : **46** : 493–99.

The use of hybrid poplars for intensive production of pulpwood in the USA is discussed in respect of results of trials with numerous interspecific hybrids during the past 20 years.

2164. PAULEY, S. S.
Flowering habits in *Populus*.
Genetics 1950 : **35** : p. 684. (Abst.).

In the aspens and balsam poplars, flowering period and time of seed maturity appear to be highly regular within the limits of ecotypic zones; fluctuations in flowering time from year to year may, however, be considerable, the controlling factor apparently being current temperatures. Time of seed fall of cottonwood (*P. deltoides*) in the Mississippi Valley shows adaptation of high survival value in relationship to destructive spring and early summer floods; within uniform local areas, seed fall during a single season may occur during May, June, July and even early August. Considerable interspecific and intraspecific variation in the age at which first flowering occurs in native *Populus* species in the United States is also reported.

2165. LIÉNARD, G.
Communication sur la culture du peuplier. (**A communication on the cultivation of the poplar**).
Agricultura, Louvain 1950 : **48** : 198–235.

Part of this lecture to the Association of Old Students of the Agronomic Institute of the University of Louvain refers briefly to reproduction, hybridization, mutation and polyploid

forms with reference to the poplar. A table is given showing the poplars acclimatized in Belgium. As some of the different types of the black poplars are difficult to identify, an outline is given of their main characteristics, with observations on the disease and frost resistance of various species and varieties.

2166. Schreiner, E. J.
Variation between two hybrid poplars in susceptibility to the inhibiting effect of grass and weeds.
J. For. 1945 : **43** : 669–72.

Measurements of the average height, average total growth and survival were made at the Northeastern Forest Experiment Station, Philadelphia, Pa., to determine the inhibiting effects of grass and weeds on the hybrids *Populus Maximowiczii* x *P. trichocarpa* and *P. Maximowiczii* x *P. berolinensis*. Although the *P. berolinensis* hybrid is inherently less vigorous than the *P. trichocarpa* hybrid, its average height, when surrounded by a maximum growth of grass and weeds, was greater; this result indicates that the *P. trichocarpa* hybrid is readily influenced by the inhibitory effect of surrounding grass and responds by a reduction in growth rate.

2167. Wester, H. V.,
Davidson, R. W. and
Fowler, M. E.
Cankers of linden and redbud.
Plant Dis. Reporter 1950 : **34** : 219–23.

Tilia spp. inoculated in the National Capital Parks, Washington, DC, exhibited a wide range of susceptibility to infection by *Botryosphaeria* and *Diplodia*. *T. neglecta* showed most susceptibility, on the basis of size of cankers; the European species *T. platyphyllos*, *T. europaea* and *T. dasystyla* proved to be highly resistant.

2168. Webb, W. E.
A report on *Ulmus pumila* in the Great Plains region of the United States.
J. For. 1948 : **46** : 274–78.

From a study of the oriental elms planted in the Great Plains it appears that *U. pumila* is the Siberian elm and *U. parviflora* should be called the Chinese elm. Hybridization has resulted from pollination between *U. pumila* and *U. americana* which flower simultaneously. Differences in susceptibility to winter killing are reported between southern and northern strains of *U. pumila*; the northern strain has proved to be winter hardy.

2169. Frederick, L. and
Howard, F. L.
Comparative physiology and pathogenicity of eight isolates of *Ceratostomella ulmi*.
Phytopathology **1951** : **41** : 12–13. (Abst.).

Differences in the pH of cultural media produced varied responses from eight culturally distinct isolates of *Ceratostomella Ulmi*. No correlation was found between mycelial growth and toxin concentration or polysaccharide yield; nor between toxin concentration and polysaccharide yield or degree of pathogenicity on *Ulmus* seedlings.

2170. Pilipenko, F. S.
(The development of species and forms of *Eucalyptus*).
Agrobiologija (Agrobiology) **1950** : No. 4 : 45–59. [Russian].

As a result of a new environment, *Eucalyptus* plants may change into new forms when they are grown from seed along the Black Sea Littoral. The effect of external conditions can

be so profound that a species may change, without hybridization, into another species. Species of hybrid origin may give rise to plants of several existing species and to new and intermediate forms. Changes of related species into others under the same conditions follow analogous patterns.
The constancy of inheritance of the new forms is directly related to their adaptability to the environment. Forms not wholly adapted to it give rise to new more constant forms.
Most of the changed species and forms are as hardy as or hardier than the original material. The degree of their hardiness is determined by the environment in which they have developed.
The great changeability of *Eucalyptus* under changed external conditions is an asset in breeding for hardiness. Reference is made to breeding work at Suhum where 30 hybrid forms of *Eucalyptus* were obtained before the war. Ten of these have been selected and tried on an industrial scale in the humid subtropics.
Probable evolution in a small section of *Eucalyptus* is traced. As a result of the findings a revision of the taxonomy of the genus is advocated.

2171. Cummings, W. H.
Progeny test with black locust seed from mother trees of varied age and height growth.
J. For. 1947 : **45** : 793–98.

Results obtained in Ohio from a study of progeny from mother trees of varied age and vigour have shown that although the influence of the mother tree on the characteristics of the seedling is not apparent at the age of one year, significant effects gradually become established in the progeny. At the age of six years, progeny of a young, fast-growing tree were 11 feet taller than progeny of a slow-growing tree of medium age. The importance of selecting vigorous young parent trees as seed source is emphasized.

2172. Carpenter, I. W. and
Guard, A. T.
Some effects of cross-pollination on seed production and hybrid vigour of tuliptree.
J. For. 1950 : **48** : 852–55.

The results of a study of Purdue University, Ind., to determine whether continual self pollination affects the viability of *Liriodendron tulipifera* seed are reported. By controlled pollination it was found that cross pollination increased the percentage of viable seed and that self pollination on one tree resulted in a large percentage of sterile seeds. The average total height of seedlings produced by cross pollination was greater than that of open-pollinated seedlings; pollen from more distant trees produced the greatest increase in vigour, and reciprocal crosses gave almost uniform increases. The possibility of obtaining populations of *L. tulipifera* of different genetic constitution from widely separated seed parents is discussed with respect to improved germinating capacity and more vigorous seedlings.

2173. Fielding, J. M.
The Institute of Forest Genetics.
Aust. For. 1950 : **14** : 43–46.

Work on interspecific hybridization of *Pinus* in progress at the Institute of Forest Genetics, Placerville, Calif., is described. Promising hybrids include: *P. monticola* x *P. excelsa*, *P. monticola* x *P. Strobus*, *P. Strobus* x *P. excelsa*, *P. ponderosa* x *P. ponderosa* var. *scopulorum*, *P. ponderosa* x *P. apacheca*, *P. radiata* x *P. attenuata*, *P. radiata* x *P. muricata*, *P. Murryana* x *P. Banksiana*, *P. ponderosa* x *P. apacheca* and *P. Jeffreyi* x *P. Coulteri*. The possible value of a programme of interspecific hybridization in Australia is discussed.

2174. Duffield, J. W. and
Liddicoet, A. R.
Variability of rooting in a small second-generation population of the hybrid *Pinus attenuradiata*.
J. For. 1949 : **47** : 107–09.

Information is reported on the variability of rooting capacity of different members of a hybrid population of three-year old seedlings from a group of wind-pollinated trees of *Pinus attenuradiata* (*P. attenuata* x *P. radiata*). It appears that individual seedlings vary in rooting ability; those plants which are readily propagated may be used for cuttings more effectively than heterogeneous material.

2175. Sato, Y. and
Yamaguchi, S.
(On racial differentiation in *Abies*).
Jap. J. Genet. 1942 : **18** : 71–74. [Japanese].

Five races of *A. Mayriana* and two of *A. sachalinensis* are distinguished on the basis of the morphology of the cones and cone scales.

2176. Stone, E. C. and
Duffield, J. W.
Hybrids of sugar pine by embryo culture.
J. For. 1950 : **48** : 200–01.

Crosses between *Pinus Lambertiana* and the blister rust resistant species *P. Armandi* and *P. koraiensis* generally produce seeds which fail to germinate successfully. A modified embryo culture technique is described, by which hybrid seedlings were obtained at the California Institute of Forest Genetics from *P. Lambertiana* pollinated with pollen from *P. Armandi* and *P. koraiensis*; their reaction to *Cronartium ribicola* has not yet been investigated.

2177. Daubenmire, R. F.
A comparison of season of cambial growth in different geographic races of *Pinus ponderosa*.
Bot. Gaz. 1950 : **112** : 182–88.

Radial growth was investigated in 41 trees of *P. ponderosa* and its variety *scopulorum* during 1948. The trees represented 14 populations collected in the western United States and had been grown at Priest River Experiment Forest in northern Idaho since 1911–17. Variation in growing season was found within populations; little difference between populations was noted. No evidence of correlation between frost damage and radial growth that continues late in the season was obtained. Day length did not appear to exert any influence upon growing season. Duration of cambial activity showed no relationship to the grouping of the populations into races on the basis of morphological and anatomical characters.

2178. Johnson, A. G.
Sexual maturity in two white pine species.
J. For. 1947 : **45** : p. 826.

The age at which the first flower is produced in *Pinus Peuce* and *P. Armandi*, which are regarded as promising species for the production of heterotic hybrids, is discussed with reference to specimens growing at Waukesha, Wisc., and Morton Arboretum, Lisle, Ill. respectively.

2179. Duffield, J. W.
Techniques and possibilities for Douglas-fir breeding.
J. For. 1950 : 48 : 41–45.

A technique for controlling pollination in *Pseudotsuga* is described and results are presented for investigations carried out at Placerville, Calif. The types of pollination attempted were: selfing, on one tree, from which very few sound seeds were obtained; intraspecific crosses, which yielded a much higher percentage of sound seed than uncontrolled wind pollination; and interspecific crosses with *P. macrocarpa*, from which only three sound seeds were obtained with difficulty and these failed to germinate. Possibilities for applying the technique to genetical improvement of Douglas fir through selective breeding and hybridization are discussed.

2180. Mirov, N. T.
***Pinus*: a contribution of turpentine chemistry to dendrology and forest genetics.**
J. For. 1946 : 44 : 13–16.

Each species of *Pinus* has a specific turpentine by which it can be identified. *P. ponderosa* varieties in California show differences in the optical properties of the specific turpentine, and it is hoped that a study of the frequency distribution of dextrorotatory and laevorotatory turpentines among populations of this species complex will yield interesting information on the genetics of this pine.
Additional information is required on the inheritance of turpentines in interspecific hybrids. The occurrence of a hybrid between *P. ponderosa* and *P. Jeffreyi* containing terpenes inherited from the *P. ponderosa* parent and heptane from the *P. Jeffreyi* parent is reported.

2181. Vasiljev, V. N.
(The Far Eastern spruces of the section *Omorica* Willkm.).
Bot. Ž. (Bot. J.), Moskva 1950 : 35 : 498–511. [Russian].

The descriptions of the spruces of the section *Omorica* include one new species: *Picea Komarovii*.
The following misnomers in the nomenclature of spruces are pointed out: *P. ajanensis*, which has been erroneously identified with *P. jezoensis*; *P. Alcockiana*, which is regarded as a *nomen nudum*; and *P. microsperma*, regarded as a botanical variety of *P. ajanensis*.

2182. Hirt, R. R.
Evidence of resistance to blister rust by eastern white pine growing in the Northeast.
J. For. 1948 : 46 : 911–13.

Individual white pines resistant to *Cronartium ribicola* are reported in New York State.

2183. Childs, T. W. and
Bedwell, J. L.
Susceptibility of some white pine species to *Cronartium ribicola* in the Pacific Northwest.
J. For. 1948 : 46 : 595–99.

The results of susceptibility tests in Oregon and British Columbia are reported. In order of increasing susceptibility the species tested can be listed as follows: *Pinus Armandi*, *P. Griffithii* (*P. excelsa*), *P. koraiensis*, *P. aristata*, *P. Peuce*, *P. flexilis* var. *reflexa*, *P. Strobus*, *P. flexilis*, *P. monticola* and *P. Lambertiana*; these results agree with those obtained in Europe and eastern North America. Evidence is given of the occurrence of a few resistant trees in the susceptible species *P. Lambertiana*.

2184.

News of the World. United States of America.
Unasylva 1950 : 4 : 181–82.

Interspecific hybrid seeds obtained from the fertilization of *Pinus Lambertiana* with pollen from *P. Armandi* and *P. koraiensis* have germinated successfully at the Institute of Forest Genetics, Calif. and appear to be developing normally. It is hoped that the resistance to *Cronartium ribicola*, shown in the Asiatic white pine species, will be inherited by some of the progeny.

2185. Scamoni, A.
Ein Lärchenherkunftsversuch in Eberswalde und seine weitere Entwicklung. (**A larch provenance study in Eberswalde and its further development**).
Züchter 1951 : **21** : 36–38.

Larches of different geographical origin, i.e. from Sudetenland, Wiener Wald, Steiermark, Poland, Hesse and Silesia, were planted in 1933. Measurements of height in 1939, 1941 and 1949 showed that in all three years the larches from Sudetenland and those from Silesia, which were also Sudeten larches, showed the greatest average heights, the standard being the larches from Steiermark which gave the lowest average heights.
The Sudeten larch is less affected by drought than the Alpine larch. The incidence of canker has been hitherto regarded as independent of provenance, but in 1941 for the first time two trees from Turrach (Steiermark) and one from Altlengbach (Wiener Wald) were attacked by the fungus.
The suitability of the larches for various altitudes and types of climate is indicated.

VEGETABLES

2186. Schuphan, W.
Aktuelle Fragen im Gemüsebau. (**Topical problems in vegetable cultivation**).
Landw. angew. Wiss. 1949 : No. 14 : 97–113.

The need is pointed out for breeding a variety of Brussels sprouts and of early kohl rabi with improved quality of leaf and of a garden beet with leaves similar in flavour, tenderness, biological qualities and low saponin content to those of the Swiss chard.

2187. Doolittle, S. P.
Vegetable disease investigations in the United States Department of Agriculture, 1885-1950.
Plant Dis. Reporter 1950 : Suppl. 195 : 398–412.

A section of this paper gives a concise survey of early and recent breeding work on disease resistance in sweet potato, cabbage, lettuce, onion, musk melon, water melon, cucumber and beans in the United States.

2188. Hartmair, V.
Ergebnisse der Sortenprüfungen bei Gemüse für das österr. Zuchtbuch in den Jahren 1949 und 1950. (**Results of the variety trials of vegetables for the Austrian Breeding Register in the years 1949 and 1950**).
VersErgebn. Bundesanst. alp. Landw. Admont 1951 : No. 7 : Pp. 28. (Mimeographed).

In all, 43 varieties of various vegetables, i.e. cabbage, kohl rabi, lettuce, radish, garden beet, carrots and peas, were tested for varietal purity and performance; in most cases the varieties were tested in two localities, Admont-Krumau and Kaiserau, respectively 640 and 1150 meters above sea level. The results shown in tables are discussed.

2189. Banga, O. and
Sneep, J.
Veredeling van tuinbouwgewassen in Denemarken. (**Horticultural plant breeding in Denmark**).
Meded. Direct. Tuinbouw 1950 : **13** (10) Suppl. : 289–311.

Observations during a visit to Denmark in 1947 form the subject of this article, in which the organization and methods of variety trials used in connexion with the breeding of horticultural plants and in seed production of vegetables are described. Some notes are included on varieties of cabbages, root crops, beet, celeriac, tomatoes, apples and strawberries.

2190. Banga, O.
Veredelingsmethodiek bij de rode biet. (**Methods of breeding red garden beet**).
Meded. Direct. Tuinbouw 1950 : **13** : 575–92.

Selection is based mainly on rate of growth and reliability of harvest, and shape and thickness of the root, smoothness of the skin, colour of flesh and eating quality. When breeding for special conditions, such as short day or unfavourable growth conditions, selection should be done under these conditions. Mass, family, line and parent selection can be applied. Selection naturally tends to inbreeding and the resulting weakness must be overcome by crossing inbred lines.

2191. Banga, O.
Krotenstudies. VI. De invloed van het loof op de groeisnelheid van de knol. (**Red garden beet studies. VI. Influence of the foliage on the rate of growth of the root**).
Meded. Inst. Vered. Tuinbouw. Wageningen 1950 : No. 19 : 3–30.

Banga, O.
Krotenstudies. VII. Classificatie van platte en ronde kroten naar knolindex, niveau van loofprestatie en groeisnelheid. (**Red garden beet studies. VII. Classification of flat and round beet according to the root index, efficiency of foliage, and rate of growth**).
Ibid. 1950 : No. 19 : 31–79.

Foliage affects the growth rate of the root by its efficiency and, for any given efficiency, by its quantity. Varieties and selections also differ in rate of root formation. The number of leaves formed is not influenced by length of day but by temperature; but day length does affect the mean weight of a leaf. The root index is the ratio length: diameter. The foliage efficiency is the weight of foliage required to produce 100 grm. of root; four levels are recognized but these are not distinct. Rate of growth is measured by the number of days from sowing to 75% harvested, and the mean weight of root. Seven degrees are recognized.
Strains of Egyptian with a root index <0.63 are "flat" and between 0·63 and 0·69 "thick flat". Strains of Crosby usually have an index higher than 0·69. Crosby and Early Wonder overlap, but the latter usually has a higher index than Crosby.

2192. Sørensen, H.
Stammeforsøg med knoldselleri 1946–1948. (**Strain trials with celeriac 1946-48**).
Tidsskr. Planteavl 1950 : **54** : 93–106 : 171–72.

The performance of 22 strains of celeriac at four Danish experimental stations is recorded. It was found that the original varieties had been extensively intercrossed to obtain an ideal type with a smooth round bulb and a compact root. Though yields showed marked variations, the six strains which gave the highest yield of "usable bulbs" were certified and awarded the designation II. The quality lacked uniformity and breeders are warned against hollow bulbs, a common defect.

2193. SVENSSON, V.
Förädlingsarbetet med morötter å Weibullsholm. **(Breeding work with carrots at Weibullsholm).**
Weibulls Ill. Årsb. 1950 : **45** : 38–44.

Carrot breeding at the Weibullsholm Institute, Sweden, has included the following aims: improved varieties which grow fast and are suitable, when raised in frames or in the field, for spring and summer use; and other high yielding varieties of good quality and keeping properties for autumn and winter use. Carotene content has also been investigated (cf. Abst. 2194).
The results of breeding operations have led mainly to improvement in the varieties used rather than to the production of new forms. The breeding material has included Amsterdamer, Guerande, London Torg [London Market], Pariser Driv [Paris Forcing], Regulus and Vertou, of which short descriptions are given.
Work is in progress on a cross of Amsterdamer x London Torg to obtain an earlier, well coloured, field carrot and on an Amsterdamer x Regulus cross to improve the quality of Regulus as regards size of core, colour and carotene content. A family No. 755 of Juvel [Jewel] is being multiplied as being particularly suitable for growing in the cold frame and for late sowing. It has also done well in experiments in Norrland.

2194. LAMPRECHT, H. and
SVENSSON, V.
Karotinhalten i morötter och dess beroende av olika faktorer. **(Carotene content in carrots and its dependence on different factors).**
Agri Hortique Genetica, Landskrona 1950 : **8** : 74–108.

Experiments are recorded on the differences in carotene content of (1) 12 of the main varieties of carrots grown in Sweden and (2) strains of the same variety. The relation between carotene content, colour and size of root was also studied and the effects of soil, time of sowing and harvesting, locality and storage period were noted.
The question of the source and distribution of error that may occur in comparing varieties or strains is specially considered.

2195. FUKUSHIMA, E.
(On the F_1 hybrid between *Brassica carinata* and the radish).
Jap. J. Genet. 1942 : **18** : 202–03. [Japanese].

F_1 hybrids between *B. carinata* ($n = 17$) and *Raphanus sativus* ($n = 9$) had $2n = 26$ chromosomes and were highly sterile. There were 0 to 4 bivalents, and univalents were also observed which split longitudinally partly in the first and partly in the second meiotic division. Polyads or sometimes dyads were formed. The genome of *B. carinata* is represented by bbcc, that of *R. sativus* by RR and that of the F_1 hybrids by bcR.

2196. KONDO, N.
[**A *Raphanobrassica* produced from the cross *Raphanus sativus* (4x) x *Brassica oleracea* (4x)**].
Jap. J. Genet. 1942 : **18** : 126–30. [Japanese].

A new *Raphanobrassica* was obtained from the cross between colchicine induced autotetraploid *R. sativus* and autotetraploid *B. oleracea*. At meiosis 1 to 7 polyvalents and 0 to 1 univalent were observed in the autotetraploid *R. sativus* and 2 to 5 polyvalents and 1 to 2 univalents in the autotetraploid *B. oleracea*. From the cross between them 35 seeds were obtained of which 29 produced offspring. These were morphologically intermediate between the parents. There were in general 36 somatic chromosomes forming 18 bivalents but one plant was hypotetraploid with 17 bivalents and 1 univalent while another was hypertetraploid with 18 bivalents and 1 univalent.

2197. Pound, G. S. and
Fowler, D. L.
A *Fusarium* wilt of radish in Wisconsin.
Phytopathology 1951 : **41** : p. 30. (Abst.).

All the commercially grown varieties of radish in Wisconsin were susceptible to a wilt caused by an organism apparently identical with *Fusarium oxysporum* var. *Raphani* isolated in California. Resistance in the variety Scarlet Globe has been developed by selection.

2198. Beal, J. M.
Chromosome aberrations in onion roots from plants grown in an atmosphere containing $C^{14}O_2$.
Amer. J. Bot. 1950 : **37** : 60–61. (Abst.).

Chromosome aberrations were observed in root tips of bulbs of the onion variety Ebenezer which had been grown in an atmosphere containing $C^{14}O_2$. Fragments, apparently resulting from chromosome breakage, were of frequent occurrence.

2199. Beal, J. M. and
Scully, N. J.
Chromosomal aberrations in onion roots from plants grown in an atmosphere containing $C^{14}O_2$.
Bot. Gaz. 1950 : **112** : 232–35.

Sets of the onion variety Ebenezer grown under conditions of controlled temperature and humidity had their natural supply of atmospheric carbon dioxide supplemented by the addition of $C^{14}O_2$ so that the total concentration varied from 0·03 to 0·1%; a photoperiod of 16 hours was applied. Dividing root tip cells showed chromosome and chromatid breaks and fragments, bridging and micronuclei.

2200. Jakowska, S.,
Nigrelli, R. F. and
Goldsmith, E. D.
Growth responses in *Allium Cepa*. Studies with 4-amino-pteroylglutamic acid.
Caryologia, Pisa 1950–51 : **3** : 1–10.

The effects of aminopterin, 4-amino-pteroylglutamic acid, on *Allium Cepa* root tips, root primordia and seedlings are summarized as cytological, morphogenetic, necrotic and probably physiological. Using concentrations varying between $4{\cdot}5 \times 10^{-4}$ M and $2{\cdot}3 \times 10^{-8}$ M, mitosis was arrested at a prophase-like stage. No evidence could be obtained of the correlation of this effect with changes in nucleic acid content. Inhibition of division ceased after prolonged treatment but, while mitosis was suppressed, cell elongation in seedlings proceeded at the same rate as in the controls and cell differentiation was apparently unaffected. The stunting effect of 0·005% indole-3-acetic acid was not observed when used in combination with aminopterin at concentrations of $1{\cdot}1 \times 10^{-5}$ M or lower.

2201. Minderhoud, A.
De plaatsvastheid van insecten in verband met de plantenveredeling.
(The fixation areas of insects in relation to plant breeding).
Meded. Direct. Tuinbouw 1951 : **14** : 61–70.

For the information of plant breeders, experiments are recorded on the role of the honey bee, the humble bee and various kinds of flies in plant pollination. The honey bee tends to restrict its flights to visiting distinct limited areas, but this is not so when flying on very small plots.

2202. HONDA, M.
(Two species of yama rakkyo*).
Bot. and Zool. 1940 : **8** : p. 97. [Japanese].

A new species of *Allium*, *A. Yamarakkyo*, related to *A. Thunbergii*, is described. It is endemic to Japan.

2203.
Sorts- og stammeforsøg med vinterporre. 1946–48. **(Trials with varieties and strains of winter leek. 1946–48).**
Tidsskr. Planteavl 1950 : **54** : 173–75.

Danish bred leeks were compared as regards yield, keeping property and quality under the experimental conditions and on the different soils at Hornum, Spangsbjerg, Blangstedgaard and Virum. The results are tabulated with notes on the eight successful strains certified.

2204. MIHAĬLOVA, L. V.
(The conversion of cabbage into rape).
Agrobiologija (Agrobiology) 1950 : No. 4 : 38–44. [Russian].

In vernalization experiments with cabbage, begun in Moscow in 1935 and interrupted during the period 1941 to 1946, the progeny of the original cross Nomer Pervyĭ [Number One] x Valjvatjevskaja segregated two rape individuals, *Brassica Napus* vars. *esculenta* as well as plants having some characters of var. *Sabauda, gemmifera, botrytis, acephala, gongylodes* and *sylvestris* of *B. capitata*. The hybrid plants from the original cross were transplanted to the field after 57 days of vernalization treatment in the spring of 1936 before they passed through the vernalization phase. The summer was hot and dry and the plants were unable to complete the phase. Only two individuals began but did not pass through the flowering phase. In the autumn the plants were dug up and were left in pots in a cold glasshouse to complete the vernalization phase. This they did in mid-February when they were given the light and temperature conditions required by the plants to pass through the next phase, i.e. temperatures of 10–25° and additional illumination with 500 watt bulbs. The plants grew vigorously and flowered abundantly. The flowering was early. In April, 1937, the plants were transplanted to the field. From 1937 onwards three of the surviving plants were propagated vegetatively, buds being taken from different positions on the stem. The buds were rooted under varied external conditions. In autumn 1937 the plants were dug up in the field and transferred to the glasshouse as in the previous year. In this manner the plants were grown for five years. In 1941 the clones, numbering 30 plants, were transplanted to a single plot for the purpose of cross pollination. The seed from the cross pollinated plants was collected but because of the war it was not sown until 1946. It is pointed out that the seed was maintained in a pure state.
More extensive segregation occurred in 1947. This is explained by abnormal weather conditions in the summer of 1947 and by a larger number of experimental plants. The 1947 progeny included two rape individuals. One of these plants was lost in the winter of 1947–1948, but the other survived and gave a good amount of seed.
The first and second seed generations of the rape plant gave rapes. The second seed generation segregated in respect of root shape.
This rape produces roots weighing as much as 45 kg. and is regarded as a promising forage plant.
Cytological analyses of the roots showed that they had 24 to 32 chromosomes, while *B. oleracea* var. *capitata* has $2n = 18$ and rape $2n = 36$.

2205. SCARAMUZZI, F.
Il miglioramento delle razze orticole di finocchio dolce. **(The improvement of horticultural varieties of sweet fennel).**
Riv. Ortoflorofrutticolt. Ital., Firenze 1951 : **35** : 19–27.

The biology of flowering, systematic classification, floral morphology, anthesis and pollination of *Foeniculum vulgare γ dulce* are discussed.

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* Literally, mountain shallot.

The sweet varieties in cultivation in Italy are both self compatible and intercompatible. Botanical varieties may also cross *inter se.* Parthenocarpy has not been observed. Pollen transference is carried out mainly by insects. In view of these findings, the importance of maintaining the purity of fennel strains is stressed.

2206. YAMADA, Y.
(Field trials of polyploid *Brassica pekinensis*).
Jap. J. Genet. 1942 : **18** : 177–78. [Japanese].

The behaviour in the field of colchicine-induced tetraploids of *B. pekinensis* is discussed, special attention being devoted to vegetative period, and the size and weight of the heads.

2207. WALKER, J. C. and
LARSON, R. H.
Progress in the development of clubroot-resistant cabbage.
Phytopathology 1951 : **41** : p. 37. (Abst.).

Resistance to club root, combined with yellows resistance, has been obtained in the F_5 from back crosses of resistant kale-cabbage rogues with the yellows resistant variety Wisconsin Ballhead. A second back cross was necessary, using the yellows resistant Marion Market, Resistant Charleston Wakefield and All Head Select. Although susceptibility to club root was completely dominant in crosses between highly resistant and susceptible parents, the F_2 produced 10–20% resistant indiviuals, indicating polygenic inheritance.

2208. FERBER, R.
(Growing autumn cauliflowers).
Hassadeh 1949 : **29** : 486–88. [Hebrew].

For some years the variety Mashmar Haemek has been popular with growers as a hardy cauliflower that can be cut from October onwards, withstands low temperatures and is resistant to the black vein disease. It is now being superseded by variety 314, which is equally hardy and resistant to black vein disease and which comes into maturity a few weeks earlier, so that better sized heads can be cut when demanded by the market. Yafanit Bakira [Selected Japanese] is a later autumn variety with heads sweeter than those of the above; its yield however is lower. Yafanit Afila [Late Japanese] grows slowly, giving medium crops; it is also resistant to black vein.

2209. HAZERA.
(A new lettuce).
Hassadeh 1949 : **29** : p. 494. [Hebrew].

The lettuce Rinat Hakfar [Joy of the Village] is the result of a cross between Rosh Zahav [Golden Head] and Yarkan [Green Stone] made in 1944 at Ben Shemen. The new variety can be grown all the year round. It is disease resistant, large headed, and has golden green leaves.

2210. ONO, H.
(Meiosis in a hybrid between *Paraixeris denticulata* and *Lactuca squarrosa*).
Jap. J. Genet. 1942 : **18** : p. 82. [Japanese).

Meiosis is described in a 12-chromosome hybrid of *P. denticulata* ($2n = 10$) and *L. squarrosa* ($2n = 18$). Two quadrivalents were observed in some cells.

2211. VAARAMA, A.
Chromosome number and cryptic polyploidy in *Lepidium sativum.*
Hereditas, Lund 1951 : **37** : 290–92. (Abst.).

The chromosome number of 11 samples of *L. sativum* from various sources has been found to be $2n = 24$, in contrast to the numbers of $n = 8$ and $2n = 16$ reported by other investigators. Two of the samples, representing the subvarieties *crispum* and *latifolium* of var.

vulgare, originated from northwest India, the region considered to be the centre of orgin of *L. sativum*. It is suggested that the genus *Lepidium* has a basic number of $x = 4$ and that it is characterized by cryptic polyploidy.

2212. RAGHAVAN, T. S. and VENKATASUBBAN, K. R.
Studies in the Capparidaceae. VIII. The cytology of *Capparis zeylanica* Linn. and related genera.
Cytologia, Tokyo 1940 : 11 : 319–31.

The following chromosome numbers are recorded: *Capparis zeylanica*, $n = 20$, *Cadaba indica*, $n = 18$ and *Maerua arenaria*, $n = 10$. Meiosis in *C. zeylanica* is described in some detail, especially as regards secondary association. It is shown that polyploidy and structural changes in the chromosomes have both played a part in the evolution of the species. Secondary association and its limitations as a factor in determining ancestral homology are discussed in the light of the present and other findings. A tentative scheme to show the phylogenetic evolution of some important genera of the Capparidaceae is presented.

2213. CÁRDENAS, M.
Plantas alimenticias nativas de los Andes de Bolivia. III. Frutos comestibles. (**Edible native plants of the Bolivian Andes. III. Edible fruits**).
Folia Univ., Bolivia 1950 : 4 : No. 4 : 86–108.

The various forms of cucurbits grown in Bolivia are described. Notes follow on Solanaceous fruits, *Passiflora*, Anonaceous fruits, Cactaceous fruits and a few miscellaneous fruits.

2214. INOUE, Y. and ABE, S.
(**The results of treating melons with colchicine. III.**).
Bot. and Zool. 1939 : 7 : 1879–82. [Japanese].

Diploid and colchicine-induced tetraploid lines of the variety Hero of Lockinge were compared in respect of the morphology of the stem and leaves, flower characters, the weight, size, shape and thickness of the flesh of the fruits, and vegetative period. In general, the tetraploid fruits were inferior to the diploid.

2215. *HOHLAČEVA, N. A.
(**New varieties of melons and gourds**).
Sad i Ogorod (Fruit and Vegetable Gardens) 1950 : No. 12 : 55–56. [Russian].

Descriptions are given of three new hybrid varieties of melon and one new gourd bred at the Krasnodar Vegetable and Potato Breeding Station. The new varieties have passed their trial stage.

Melon
Novinka Kubani B–17 [Novelty of Kubanj B–17], Limonnoželtaja G–1 [Lemon Yellow G–1] and Krasnodarskaja B–19 [Krasnodar B–19] are productive mid season varieties with fruits of good quality. The fruit of Limonnoželtaja G–1 keeps well and has good transportability, and is suitable for dry processing.

Gourd
Several new gourds developed at the institute, including Stolovaja Zimnjaja A–5 [Winter Table A–5] did well in the trials. Stolovaja Zimnjaja A–5 has good keeping properties and high sugar, solids and starch contents. It is more productive than Mozoleevskaja and Medovaja Belaja [White Honey], but less productive than Perehvatka 69/19 [Girdle 69/19].

* An extended summary of this paper is on file at the Bureau.

2216. SHOWALTER, A. M.
The segregation of fruit shapes in selected inbred lines of *Cucurbita moschata* var. Golden Cushaw.
Genetics 1950 : **35** : p. 691. (Abst.).

The variety Golden Cushaw was subjected to selection and roguing for five or six generations to obtain uniform fruits of desirable shape and size. Little progress was however achieved until controlled pollination was practised. Many selected lines have been selfed by hand; after three generations several distinct types are approaching constancy. Crosses of inbred lines bearing fruits of widely divergent shape produce F_1 hybrids with fruits of intermediate shape. The presence of many genes affecting fruit shape is postulated.

2217. GODFREY, G. H.
Rio-Sweet.
Sth. Seedsman 1951 : **14** : No. **3** : 65, 74.

The characteristics of a new variety of cantaloupe, Rio-Sweet, produced by the Texas Agricultural Experiment Station, are described. Its resistance to downy mildew was derived from a wild form of *Cucumis Melo* which was crossed with the commercially grown cantaloupe Hale's Best. Resistant F_1 plants were then crossed with the cantaloupe variety Smith Perfect and a promising strain B–17 was obtained. Further selection and controlled crosses have produced the new variety, which outgrows all standard varieties and bears large, well formed fruits, yellow-green in colour with a grey surface network. The attractive apricot coloured flesh is firm and sweet and shows superior eating and keeping qualities.

2218. MCKEEN, C. D.
***Fusarium* wilt of muskmelons and watermelons in south-western Ontario.**
Phytopathology **1951 : 41** : p. **26.** (Abst.).

Monosporous *Fusarium* wilt isolates from water melons and musk melons produced severe symptoms on both genera irrespective of their original hosts. Three isolates from water melons showed pathogenic differences regarding the rate of wilting in infected water melon seedlings.

2219. ANDRUS, C. F.
Congo popularity increases.
Sth. Seedsman **1951 : 14** : No. **3 : 36–37, 55, 62.**

The characteristics of the water melon Congo (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 1213) are discussed with particular reference to its tendency to produce fruits with a hollow heart, and its thin rind which gives insufficient protection against bruising. Compared with other commercially grown varieties, Congo escapes severe sunburn by retaining healthy leaves, a characteristic resulting from anthracnose resistance.

2220. SHOWALTER, A. M.
The inheritance of fruit shape in a variety of *Cucurbita moschata*.
Va J. Sci. **1950 : 1 : 351–52.** (Abst.).

Individuals of widely divergent fruit shape have arisen, by many generations of selection and inbreeding, from a single pear shaped fruit. Hybrids similar to the original parent have been obtained by crossing the extremes of these inbred types. It is presumed that many genes affect the fruit shape.

2221. SCHOENIGER, G.
Genetische Untersuchungen an *Cucurbita pepo*. **(Genetic studies of *C. pepo*).**
Züchter **1950 : 20 : 321–36.**

On the basis of an anatomical and developmental study of the seeds of several pumpkin species, including a form of Tschermak's Oil-bearing Pumpkin, which has soft-coated seeds,

and Zucchino line A, the seeds of which have the ordinary hard coat, the author maintains that the terms "thin-coated" and "thick-coated" should replace the terms "schalenlos", i.e. coatless, and "beschalt", i.e. coated. The thin-coated condition is due to absence of lignification in the wall of the seed coat. In investigating the inheritance of the thin seed coat Tschermak's Oil-bearing Pumpkin, a hybrid from the Styrian Oil-bearing Pumpkin crossed by the Mark Marrow, was again used and also two lines A and B of an Italian Zucchino; the only difference between lines A and B is that A has a single pattern and B a double pattern on the fruit. The form of the fruit stalk and the pattern between the narrow stripes on the fruit were also investigated genetically. Analysis of the F_2 and F_3 showed that five genes are involved; two of them condition the development of the wall of the seed coat, two the form of the fruit stalk and one gene represented by three allelomorphs controls the pattern on the fruit; genes for the form of the fruit have not yet been identified. The genes postulated are:—*H*, the principal gene for lignification of the seed coat wall, and *N*, a subsidiary one also for lignification; *P*, the gene for parallel ridges on the fruit stalk, and *p* for markedly converging ridges, *M* for modified parallelism and *m* for unmodified; *U* for the double pattern on the fruit, with its allelomorph u_n, the corresponding allelomorph for unpatterned fruit being *u*. Accordingly, the genetic formula for Zucchino A, unpatterned, is *HHNNPPmmuu*, for Zucchino B which has a dark pattern, *HHNNPPmmUU*, and for Tschermak's Oil-bearing Pumpkin, which has a pattern different from that of Zucchino B, $hhnnppMMu_nu_n$.

2222. Pathak, G. N. and
Singh, B.
Genetical studies in *Lagenaria leucantha* (Duchs.) Rusby: (*L. vulgaris* Ser.).
Indian J. Genet. Pl. Breed. 1950 : **10** : 28–35.

The inheritance of fruit characters has been studied in three intervarietal crosses of *L. leucantha*, T 16 x T 19, T 29 x T 19 and T 5 x T 29. The fruit colour was inherited in all three crosses on a monohybrid basis in the ratio of 3 patchy: 1 white; fruit taste is also determined by a single factor, bitter being dominant over sweet. The fruit shapes distinguished were conical, round, club, bottle and tumari (bottle shaped with a constricted neck). In the cross T 16 x T 19, between conical and tumari shapes, inheritance was on a monofactorial basis, tumari being dominant. The cross T 29 x T 19, between club and tumari, produced an F_1 hybrid of the bottle type and an F_2 segregating in the ratio of 9 bottle: 3 club: 4 tumari. The round and club shaped parents of the T 5 x T 29 cross produced an F_1 of intermediate shape and an F_2 in which the ratio was 1 round: 2 intermediate: 1 club, thus showing a modified monofactorial mechanism of inheritance. Data show that multiple factors seem to be responsible for both fruit maturity and seed production.

2223. Barnes, W. C.
Santee yields 2-3 times more.
Sth. Seedsman 1951 : **14** : No. 1 : 28–29, 59.

Since the release of the cucumber Santee (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 1217), a new dark green strain has been isolated. It is hoped to substitute this superior Santee, which is otherwise identical, for the original introduction.

2224. Yamada, Y.
(Colchicine-induced polyploidy in the cucumber).
Bot. and Zool. 1941 : **9** : 598–98. [Japanese].

Tetraploid cucumbers have been produced by colchicine treatment. They differ from the diploid in their slower growth, thicker organs and reduced fertility.

2225. Walker, J. C. and
Wiles, A. B.
Development of a scab-resistant pickling cucumber for Wisconsin
Phytopathology 1951 : **41** : p. 37. (Abst.).

After the scab resistant Maine 2 variety was back-crossed for five successive generations with National Pickling, two successive selfings produced homozygous, resistant progeny which were commercially acceptable.

2226. Walker, J. C.
Environment and host resistance in relation to cucumber scab.
Phytopathology 1950 : **40** : 1094–102.

Investigations at the Department of Plant Pathology, University of Wisconsin, have indicated that the optimum temperature for the development of cucumber scab (*Cladosporium cucumerinum*) is approximately 17° C. At 21° and higher temperatures, cicatrization of the incipient lesions occurred in the susceptible pickle varieties studied, resulting in relatively little damage to the plant. At optimum temperature for development of the disease, plants of the resistant cucumber Maine 2 were penetrated by the fungus but developed delimited local lesions without the rapid stem invasion prevailing in susceptible varieties. Under optimum conditions of temperature and humidity for infection, resistant and susceptible plants could be clearly distinguished at the young seedling stage. Using this method, segregating progenies from crosses between Maine 2 and susceptible varieties were analysed with a high degree of accuracy. The data revealed that the reaction to scab depended upon a single gene pair, resistance being completely dominant over susceptibility.

2227. Faan, H. C. and
Johnson, J.
Strains of the cucumber-mosaic virus.
Phytopathology 1951 : **41** : p. 11. (Abst.).

The data for comparative tests in Wisconsin show that nine strains, previously described, can be accepted with an additional five which remained pure during the tests. Other strains, differentiated largely on geographical or host criteria, are to be regarded as doubtfully distinct.

2228. Hobbs, G. A.
Investigations on a cucumber virus mechanically transmitted from sour cherry.
Phytopathology 1951 : **41** : 16–17. (Abst.).

Regional isolates of a virus from sour cherry leaves having the symptoms of necrotic ring spot have successfully induced necrotic ring spot in cucumber and pumpkin varieties; attempts to reinfect the cherry with virus isolates from the cucurbitaceous hosts failed. When compared on nine cucumber varieties, nine regional isolates of cherry virus differed in respect of the apparent concentration of virus as expressed by the number of rings on the cotyledons, the symptoms produced and the temperature requirements.

2229. Tuljženkova, F. F.
(The best cucumber varieties for screened cultivation in the extreme north and the arctic region).
Sad i Ogorod (Fruit and Vegetable Gardens) 1950 : No. 12 : 48–51. [Russian].

Russian trials with cucumbers under Arctic conditions, with notes on agricultural methods and different types of glasshouses, are reported.
Nerosimyĭ [Non-irrigated] and Jalahovskiĭ were the most productive varieties and Muromskiĭ [Murom] the earliest cucumber when cultivated in frames.
Klinskiĭ, Zmeevidnyĭ [Snake], Višerskiĭ [Višera] and Senzacija [Sensation] did best in heated glasshouses.

2230. Forlani, R.
La genetica del pomodoro. **(The genetics of the tomato).**
Ital. Agric. 1951 : 88 : 39–45.

In introducing his own work the author mentions the origin of cultivated varieties from mutant types and the difficulty of breeding plants combining large fruits with high productivity. Yield can be improved, but quality is still more important. High sugar and vitamin content, locules full of sap and a high number of seeds, which are now a by-product of the tomato industry, are aims on which the breeder could concentrate.
The main characters studied in the author's experiments were: red flesh, which is dominant to yellow; yellow skin, which is dominant to colourless; simple fruits, which are dominant to fasciated; round fruits, which are dominant to other shapes; and simple flower, which is dominant to the type with more than five petals.
During the last three years, work has also been done on pigmentation, including the effects of temperature on lycopene synthesis and on the occurrence of hard fruits. It may be possible to breed lines free from the latter defect.
Baldoni's work on heterosis is mentioned (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 2548). Unfortunately the seed is scanty in the F_1, but the method could be used for tomato production in seed beds.
On crossing varieties 15 and 21 of Bonvicini the author obtained good yields in the F_1 and F_2. He also crossed the species *Lycopersicon esculentum*, *L. pimpinellifolium*, *L. hirsutum* and *L. peruvianum*. The hybrids of *L. esculentum* and *L. pimpinellifolium* respectively with *L. peruvianum* bore seedless fruits, whereas with *L. hirsutum* the fruits contained seeds and the plants resembled *L. hirsutum* in their small, greenish yellow fruits containing solanin. Some vigorous plants were obtained which may yield some useful lines.
Cross pollination between *L. esculentum* and *L. pimpinellifolium* gave plants very like *L. pimpinellifolium* and in the F_2 vigorous plants with abundant fruits, slightly larger than those of *L. pimpinellifolium* and often sweet enough to be edible, were obtained.
The fruits of *L. pimpinellifolium* are rich in lycopene and the F_1 fruits from hybridization with cultivated tomatoes, being still richer in this pigment, are bright red, a characteristic which might be useful in tomatoes for preserving.

2231. Brežnev, D. D.
(Increasing the efficacy of fertilization in tomatoes).
Agrobiologija (Agrobiology) 1950 : No. 5 : 132–35. [Russian].

Pollination experiments with tomatoes at the USSR Institute of Plant Industry in Leningrad are reported. Yield comparisons were made on (*a*) plants pollinated with a pollen mixture of the same variety cultivated under the same external conditions in the year in which the pollination was made, (*b*) plants pollinated with mixed pollen collected from individuals of the same variety but grown on different soils, and (*c*) plants pollinated with a mixture of pollen from individuals of the same variety but of different origins. The latter group was the most productive. Biochemical analyses of the fruits showed that the fruits of plants which were pollinated with the more heterogeneous pollen contained most solids and vitamin C.
The plant material consisted of varieties Bison, Brekodeĭ [Break o' Day] and Štambovyĭ Alpatjeva [Alpatjev's Determinate].
Analogous results were obtained with intervarietal hybrids Brekodeĭ [Break o' Day] x Marglobe and VIR* 85 x Lučšiĭ iz Vseh [Best of All]. In these experiments with the initial forms as controls there were four variations. Firstly, crosses were made between plants grown alongside in the same environment. Secondly, the initial varieties had the same origin but were grown on different soil in the year the crosses were made. The pollen of a single individual was used. Thirdly, crosses were made between varieties as above, except that the pollen comprised a mixture collected from individuals grown upon three different types of soil, one of them identical with that upon which the female parent was cultivated. Fourthly, crosses were made between plants of different origins. The pollen

* Vsesojuznyĭ Institut Rastenievodstva [USSR Institute of Plant Industry].

used was a mixture collected from several male parent plants which grew alongside the female variety. Yield records are shown of the parent forms and the hybrids of the four groups mentioned. The yield increases were progressive in the order the groups are listed.

2232. Glavninić, R.
[Vegetative hybrids with mixed inheritance (so-called chimeras)].
God. Zborn. Zemjodel.-Šumarsk. Fak. Univ.-Skopje (Ann. Rep. Fac. Agric. For. Univ. Skopje) 1947/48 (1949) : **1** : 151–69. [Serbian].

Direct and reciprocal grafts were made between the tomato variety Dwarf Champion and *Solanum nigrum* at Gorki Leninskie (USSR). Certain chimeras obtained were studied in the first and second seed generations, and several individuals were found which had the characters of both tomato and of *S. nigrum*. The evidence is interpreted as proof of the thesis that chimeras are vegetative hybrids with mixed inheritance.

2233. Sachs, L.
'Vegetative hybridization' in the tomato.
Nature, Lond. 1951 : **167** : 282–83.

In an experiment on intervarietal grafting in the tomato, carried out at the Cambridge Plant Breeding Institute, no changes in leaf shape or fruit colour were observed, either in the grafted plants as previously reported (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 733) or in the progenies of the grafted plants. These results therefore give no support to the claims of the Russian investigators.

2234.
Selecciones de tomate del Instituto de Fitotecnia. **(The tomato selections of the Plant Breeding Institute).**
Inform. Invest. Agríc. (IDIA), B. Aires 1950 : **3** : No. 35–36 : p. 12.

Argentine tomato populations have been selected for improved adaptation to local conditions, and for greater hardiness and vigour. The strains 48–3, 48–16, 48–8 and 48–2 are mentioned as especially promising.

2235. Bart, D. W.
Pachytene morphology of the tomato chromosome complement.
Amer. J. Bot. 1950 : **37** : 639–43.

Analysis of the chromosome complement of *Lycopersicon esculentum* at pachytene has shown that the chromosomes have a basic structural pattern. In general each consists of (1) highly chromatic regions proximal to, and on either side of, the centromere, and (2) distal achromatic regions. Each achromatic region terminates in a telochromomere. In the case of the nucleolar chromosome 2, however, the short arm has no distal achromatic region, and since the short arm is wholly chromatic, observation of a telochromomere is difficult. A chromosome map has been constructed, based upon differences in chromatic patterns, in relative lengths of the different segments and in arm ratios. The chromosome A previously described by Lesley (cf. *Plant Breeding Abstracts* Vol. VII, Abst. 1388) is chromosome 2 of the present study.
On this basis the linkage group of the factors d_1–*p*–*o*–*s* for dwarf, peach, elongated plum fruit and compound inflorescence respectively is assigned to chromosome 2.

2236. Soost, R. K.
Cytology and genetics of five asynaptic mutants in *Lycopersicon esculentum* Mill.
Genetics 1950 : **35** : p. 694. (Abst.).

Meiotic asynapsis in five unfruitful mutants of the tomato variety San Marzano is in each case conditioned by a single recessive gene; the five mutations, designated as_1 to as_5, are

non-allelic. An intensive study of meiosis has been made in the pollen mother cells of two of the mutants, as_1 and as_4. In both, chromosome pairing is variable at pachytene, diakinesis and metaphase; some cells display normal pairing at pachytene. Both mutants show less pairing than the normal type, as_4 exhibiting less than as_1. In each mutant chromosome pairing varies from day to day, from plant to plant and according to the temperature. Chiasma frequency at diakinesis varies in a similar fashion. Univalents at anaphase I are distributed at random without dividing, or divide equationally. At the second division, the previously divided univalents are distributed at random, but the others divide, often with delay. The irregular distribution of chromosomes during both divisions results in micronuclei and aborted pollen. Crossing-over, as measured in the WO–d_1 region of chromosome I, is normal, at least in the sporocytes producing viable gametes.

2237. Oka, H.
(Biochemical studies on autotetraploid tomatoes).
Jap. J. Genet. **1942** : **18** : 118–21. [Japanese].

Diploid and tetraploid strains of *Lycopersicon esculentum* and *L. pimpinellifolium* are compared in respect of chlorophyll content per unit area of leaf, osmotic pressure of the cell sap, fresh and dry weight per unit area of leaf, CO_2 assimilation, ash content of the leaf, vitamin C content, and peroxidase activity.

2238. Turbin, N. V. and
Kozlov, V. E.
(Chromoscopic observation of seed sections of parent and hybrid forms of tomatoes).
Dokl. Akad. Nauk. SSSR (Rep. USSR Acad. Sci.) **1948** : **63** : 197–99.
[Russian].

A highly sensitive method of microphotography based on the absorption of long waves of 436 mμ, 400 mμ and 365 mμ wavelength from the mercury arc spectrum is described. On the plates thus obtained of seed sections of the broad-leaved tomato variety Affiašetta, the endosperm had a paler green colour than the embryo. The seed sections of Sparks, which has dissected leaves, appeared on the plates with the embryo intensely pink and the endosperm a paler pink. The plates showing the seed sections of a hybrid between Affiašetta and Sparks were similar to those of Sparks. It is pointed out that in the crosses between these varieties the dissected leaf character of Sparks is dominant over the broad leaf character of Affiašetta.

2239. Powers, L.
Gene analysis of weight per locule in tomato hybrids.
Bot. Gaz. **1950** : **112** : 163–74.

The results of a genetical analysis of weight per fruit locule, using the partitioning method of studying quantitative characters devised by Powers *et al.* (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2692), are reported. The material studied comprised Red Currant (*Lycopersicon pimpinellifolium*), Danmark and Johannisfeuer, F_1 and F_2 crosses between these varieties in all possible combinations and the first back cross populations. The data for the hybrid Danmark x Johannisfeuer are interpreted on the basis that the parents are differentiated by two or three major gene pairs for weight per locule, those from the cross Danmark x Red Currant on the basis that the parents are differentiated by ten or more pairs of genes. The parents of the hybrid Johannisfeuer x Red Currant were found to be differentiated by a large number of minor genes and probably two or three pairs of major genes; collectively, the minor genes exerted a greater effect on weight per locule than the major genes.

2240. Oka, H.
(On the effects of polyploidy in the tomato, in particular fruit setting ability).
Bot. and Zool. 1941 : **9** : 733–36. [Japanese].

Tetraploid strains of *Lycopersicon esculentum* had fewer and smaller fruits than the diploid progenitors and there were fewer seeds. In tetraploid strains of *L. pimpinellifolium* and *L. esculentum* x *L. pimpinellifolium* there were fewer but larger fruits, and fewer seeds.

2241. MacNeill, B. H.
Studies in *Septoria lycopersici* Speg.
Canad. J. Res. 1950 : **28** : Sect. C. : 645–72.

While studying the effects of *Septoria Lycopersici* on lines derived from *Lycopersicon hirsutum* and *L. peruvianum* stock at the Vineland Horticultural Experiment Station, Ontario, it was observed that the resistance of the *L. hirsutum* strain, PI 3833, was not inherited by its hybrid progeny, although previous workers Andrus and Reynard (*cf. Plant Breeding Abstracts*, Vol. XV, Abst. 1194) and Locke (cf. *Plant Breeding Abstracts*, Vol. X, Abst. 618) had reported that resistance to *Septoria* was controlled by a monofactorial dominant gene. It is suggested that certain modifying factors exist in *L. hirsutum* which determine the degree of resistance expressed in the hybrid derivatives.
During inoculation experiments two distinct strains of *S. Lycopersici* were detected. One causes large pycnidial lesions on resistant hosts and complete defoliation of susceptible varieties; the other produces restricted lesions on resistant types and few lesions on susceptible hosts; intermediate strains were also indicated. Attempts are being made to separate the physiological races.

2242. Harrison, A. L.
Breeding tomatoes for disease resistance.
Phytopathology 1951 : **41** : p. 16. (Abst.).

The use of a combined inoculation technique has been successful in developing breeding lines with resistance to *Fusarium* wilt, *Alternaria* collar rot and root knot. Roots and stems of seedlings with three or four leaves are immersed in a mixed suspension of *Fusarium oxysporum* f. *Lycopersici* and *Alternaria Solani*, and planted in soil thoroughly infested with *Heterodera marioni*. Only those plants resistant to all three diseases survive. Additional observations are then made in the field for resistance to *Cladosporium fulvum* and *Stemphylium Solani*.

2243. Paddock, E. F.
A tentative assignment of the *Fusarium*-immunity locus to linkage group 5 in tomato.
Genetics 1950 : **35** : 683–84. (Abst.).

Genetical data from the F_2 of the cross Missouri Accession 160 (*II XX JJ YY UU HH TT WtWt*) x Pennorange (*ii xx jj yy uu hh tt wtwt*) are presented, suggesting that the gene *T* for immunity from *Fusarium* wilt is located in linkage group V.

2244. Panjan, M.
Ispitivanje stolbur-a Solanacea i način suzbijanja. **(The study of big bud disease in Solanaceae and its control).**
Zaštita Bilja [Plant Protection], Belgrade 1950 : No. 2 : 49–58.

In trials at Zagreb, *Solanum ochroleucum* and *S. Douglasii* were found to be resistant to the big bud virus disease, probably caused by *Lycopersicon* virus 5.
S. racemigerum and its hybrids from crosses with the tomato varieties Skopski VI [Skopje VI] and Kurtovski VII proved susceptible to the disease.

2245. Andeweg, J. M.
Practijkproeven tomaten, 1948–1949. **(Commercial trials of tomatoes, 1948-49).**
Meded. Inst. Vered. Tuinbouw., Wageningen 1950 : No. 20 : 1–20.

Keuls, M.
Aanhangsel betreffende de bewerking van het cijfermateriaal. **(Supplement on the treatment of the statistical material).**
Ibid. 1950 : No. 20 : 21–24.

The main paper gives an account of strains produced in Holland of Dutch commercial varieties, tested, on the so-called Danish system, in unheated greenhouses in market gardens at various places in Holland. The object of such trials is to ascertain within a short period, mostly two years, which are the pure strains and selections of value for the practical grower. Six types of varieties, and 83 samples in all were graded for purity, yield, fruit weight and earliness.
The second paper deals with the method of evaluating the statistical data relating to performance.

2246. Oppenheimer, C.
(Experiments with tomato varieties and F_1 hybrids).
Ktavim, Rehovot 1950 : **1** : 27–34, 138–62. [Hebrew].

The results of trials carried out on tomato varieties and F_1 hybrids during several seasons in Israel are reported (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2697 and Vol. XXI, Abst. 726). Bounty is recommended as a short season variety with wide adaptability; in recent tests Pearl Harbour has given a particularly good performance and may eventually supersede Bounty. The most promising F_1 hybrids have considerably outyielded the standard Marmande and other varieties. The two best hybrids so far produced are Bison x N 35 and Marmande x N 35. Increased seed production of these two hybrids is recommended so that more extensive field trials and a study of the cost of producing hybrid seed can be undertaken.

2247. Tatebe, T.
(On interspecific hybrids involving the egg plant and related species).
Bot. and Zool. 1941 : **9** : 36–37. [Japanese].

The following hybrids are described and an account given of their fertility: *Solanum integrifolium* x *S. Melongena*, *S. Melongena* x *S. Tamago* and *S. integrifolium* x *S. Tamago*.

2248. Hagiwara, T. and
Iida, H.
(Interspecific crosses between *Solanum integrifolium* and the egg plant and the abnormal individuals which appeared in the F_2).
Bot. and Zool. 1939 : **7** : 1520–28. [Japanese].

Crosses were made between *S. integrifolium* on the one hand, and white and black fruited varieties of *S. Melongena* on the other.
Dwarfs and plants with various fruit colours were produced in the F_2. The F_1 of *S. integrifolium* x the white-fruited egg plant was characterized by marked heterosis in comparison with the F_1 of *S. integrifolium* x the black-fruited egg plant. The hybrids were partially sterile and had larger seeds than either of the parents. By various crosses the factorial composition of different strains has been determined. Crosses involving the above three types and the varieties Sensei and Sadogen enabled the following genotypes in respect of anthocyanin pigmentation to be derived: *S. integrifolium*, $R_1r_2H_1H_2$, the black-fruited egg plant, $r_1R_2h_1h_2$, Sensei and Sadogen, $R_1R_2h_1h_2$; and the white-fruited egg plant, $r_1r_2h_1h_2$.

2249. Decker, P.
Phomopsis-blight-resistant eggplants.
Phytopathology 1951 : **41** : p. 9. (Abst.).

Several selections, resistant to *Phomopsis* blight, were made from crosses of resistant egg plant varieties introduced from India with commercially grown plants. Subsequent backcrossing with the commercial varieties has resulted in the release of two new *Phomopsis* resistant varieties with desirable plant and fruit characters, well adapted to Florida conditions. Florida Market is a selection involving the commercial variety Fort Myers Market, which it resembles, and Florida Beauty was derived from a cross with Black Beauty. The Indian parents are unnamed.

2250. Horel, J.
Průzkum užitkové hodnoty jedlých luštěnin. (**Investigation of useful properties of edible legumes**).
Věstn. Čsl. Akad. Zeměd. 1950 : **24** : 263–66.

It is suggested that the study of such properties as husk ratios and cooking quality of beans, peas and lentils should be included in the trials of varieties before they are made standards in different districts.
Czechoslovakian tests of 14 varieties of pea show that both the time required for cooking and the husk ratios vary according to the district where they have been grown.

2251. Nishina, Y.,
Sinoto, Y. and
Sato, D.
Effects of fast neutrons upon plants. II. Abnormal behaviour of mitosis in _Vicia faba_.
Cytologia, Tokyo 1940 : **10** : 406–21.

Three different effects of neutron bombardment are described: (1) a primary effect, 0–24 hours after irradiation, (2) a mitosis-free period, about 24–27 hours or more after irradiation, and (3) a secondary effect, over 96 hours after irradiation.
The primary effect includes fusion and fragmentation of the chromosomes and a decrease in staining capacity with gentian violet. Statistical analysis of the results showed differences from unirradiated material with respect to the numbers of mitotic figures in different stages. There were also differences of this kind corresponding to different doses of irradiation.
The mitosis-free period results from delay in chromosome formation from the resting nuclei. It increases in duration as the neutron dosage increases.
The secondary effect includes abnormalities such as chromosome fragmentation which appear during the recovery of the cells.

2252. Golubinskiĭ, I. N.
(**An instance of a runner bean changing into a bush bean**).
Priroda (Nature) 1950 : No. 9 : p. 66. [Russian].

Changes in the growth habit of a local Ukrainian *Phaseolus* variety are reported. Seed was collected at the Scientific Research Institute for Hops, Žitomir, from an individual remarkable for its productiveness and vigour, and was planted at an agricultural college in the Rovno province. The plants developing from the seed had a bush habit. The beans with the changed habit of growth are under observation.

2253. Gould, W. A.
Quality evaluation of fresh, frozen and canned snap beans.
Res. Bull. Ohio Agric. Exp. Sta. 1951 : No. 701 : Pp. 39.

The relationship between stage of maturity and quality of fresh, frozen and canned snap beans was analysed in a large number of varieties. The investigations also included a

study of the effect of variety on fibre content in the frozen and canned products; varieties suitable for processing are indicated.

2254. Boldin, D.
(New bean variety Mironovskaja 14).
Kolhoznoe Proizvodstvo (Collective Farming) 1950 : No. 12 : p. 20. [Russian].

Mironovskaja 14, developed at the Mironovskaja State Breeding Station, gave a good account of itself in trials conducted for two years in the Kiev province. It is a productive mid season variety with a growth period of 88 to 102 days. The plants are 35–60 cm. tall and have a bush habit. The variety shows resistance to pests and diseases and shedding and has indehiscent pods. The seeds are large and pale pink and have good flavour and cookability. They contain 23% protein and 1000 seeds weigh 400 grm. when grown in the Vinnica province and 500 to 550 grm. when grown in the Kiev province.

2255. Andrews, F. S.
Resistance of Lima beans to nematodes at Walkerton, Va, 1949.
Va J. Sci. 1950 : **1** : p. 332. (Abst.).

Nine bush and climbing forms of Lima beans, including a control variety, Henderson, were tested for resistance to nematodes. The index number of Henderson, based on relative infection as indicated by degree of galling, was 4·5; this showed significantly greater susceptibility than four bush selections with an average index number 1·6 and four climbing selections which averaged 2·1.

2256. Capinpin, J. M. and
Irabagon, T. A.
A genetic study of pod and seed characters in *Vigna*.
Philipp. Agric. 1950 : **33** : 263–77.

The results of an investigation of variability in local varieties of *Vigna sesquipedalis* at Laguna, Philippines, are reported. Factorial analyses for the following characteristics were completed: colour of flower, pod and seed, date of maturity, length of pod and number of seeds per pod. The F_2 generations of numerous intervarietal crosses all produced seeds weighing, on an average, more than those of the original parents.

2257. Holmberg, S. A.
Sojabönodlingens möjligheter och berättigande i vårt land. Några erfarenheter från förädlingsarbeten och försök vid Fiskeby. **(The possibilities and claims of soya bean cultivation in our country. Some experiences from breeding work and experiments at Fiskeby).**
K. LantbrAkad. Tidskr. 1950 : **89** : 460–68.

Among the obstacles that had to be overcome in growing and breeding soya beans in Sweden was the unsuitability of foreign varieties to the Swedish climate, but by 1949 a Swedish variety Fiskeby II had been bred, and in 1950 a selection called Fiskeby III and a new variety Svalöf Ugra had been produced (cf. Abst. 139).
The present paper deals also with the question of suitable soils for soya bean cultivation, the uses of Swedish grown soya beans and the results of hybridization and selection for adaptation to the Swedish climate. Strains have been obtained that ripen at Norrköping, lat. 58° 30′. The new strains of Fiskeby III are compared with varieties grown in USA to show that in yield of beans and protein content the Swedish and the American varieties differ little, but the tests in USA record about 4% more oil. Southern Kalmar seems to be a suitable district for this crop and further breeding will aim at increased yield in combination with the present standard of quality and earliness.

2258.
Blackhawk, new early soybean for the cornbelt, excels older varieties in yield and oil content.
Crops and Soils 1951 : **3** : No. 6 : p. 31.

Developed at Ames, Iowa, the soya bean Blackhawk was bred from a cross between Mukden and Richland; it is a sister strain of the variety Hawkeye (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 1295). In extensive trials it has given higher yields of both seed and oil than any other early maturing variety in commercial cultivation.

2259. Holmberg, S.
Sojabönodlingens möjligheter. (**Possibilities of cultivating soya bean**).
Försök och Forskning 1951 : **8** : p. 14.

The substance of this article has already been reviewed in Abst. 2257.

2260. Chamberlain, D. W.
Resistance to bacterial blight in soybeans.
Phytopathology 1951 : **41** : p. 6. (Abst.).

From tests with approximately 1200 varieties, three highly resistant introductions were isolated for use in comparative studies with the susceptible varieties Illini and Bansei. Inoculated leaves of susceptible and resistant plants showed equal rates of multiplication of *Pseudomonas glycinea* during the first four days, after which the population increased rapidly in the susceptible plants in contrast with a slow decrease in the resistant varieties.

2261. Geeseman, G. E.
Inheritance of resistance of soybeans to *Peronospora manshurica*.
Agron. J. 1950 : **42** : 608–13.

Crosses involving the varieties Dunfield, Mukden, Chief, Illini and Richland were analysed for the mode of inheritance of reaction to three physiological races of *P. manshurica*. Two pairs of complementary factors, Mi_1mi_1 and Mi_2mi_2, are involved in the inheritance of resistance to all three races. Reaction to race 3 is modified by a third factor, designated Mi_R, hypostatic to mi_1 and Mi_2. The genotypes $Mi_1Mi_1Mi_2Mi_2$, $Mi_1Mi_1Mi_2mi_2$, $Mi_1mi_1Mi_2Mi_2$ and $Mi_1mi_1Mi_2mi_2$ confer a high degree of resistance to races 1 and 3 but slight susceptibility to race 2. The genotypes of the susceptible varieties Illini and Richland are assumed to be $mi_1mi_1Mi_2Mi_2Mi_RMi_R$ and $Mi_1Mi_1mi_2m_2Mi_RMi_R$ respectively; the genotype suggested for the resistant varieties Dunfield, Chief and Mukden is $Mi_1Mi_1Mi_2Mi_2mi_Rmi_R$.

2262. Kernkamp, M. F. and
Gibler, J. W.
Resistance in soybeans to root rot caused by *Rhizoctonia solani*.
Phytopathology 1951 : **41** : p. 21. (Abst.).

Twelve lines of soya bean resistant to *Rhizoctonia Solani* have been obtained in Minnesota by reselection from progenies of (Lincoln x Richland) x Lincoln, Mandarin x Richland, Mukden x Linman 533, Mukden x Wisconsin Manchu 3, Mukden x Richland, Ottawa, Mandarin and Flambeau.

2263. Hurwitz [Hurvitz], S. and
Goldin, E.
(Problems of acclimatization of the soya bean in Israel).
Ktavim, Rehovot 1950 : No. 56 : 13–17, 42–76. [Hebrew].

Experiments on varieties, sowing methods, time of harvesting and feeding value of herbage were carried out at the Rehovot Research Station during the period 1935–44. The varieties were studied with regard to plant development, growing period, pod splitting, root

nodulation and yield. Under irrigated conditions, the yellow seeded varieties Wood's Yellow, Haberlandt, Creole, Jaune Grain, White Biloxi, Palmetto and Missoy gave the highest yields of protein. In supplementary trials in the plain of Esdraelon, the early varieties Dunfield, Macoupin and China produced the best yields of protein. Laredo is recommended for green fodder production.

2264. Fuelleman, R. F.,
Burlison, W. L.,
Farnham, C. H.,
Mckibben, G. E. and
Johnson, P. E.
Soybean yields in 1949 variety trials.
Circ. Ill. Agric. Exp. Sta. 1950 : No. 669 : Pp. 4.

The results of variety trials at five centres in Illinois are summarized.

2265. Roberts, J. A. and
Pryke, P. I.
Soybeans—Victorian experiments.
J. Dep. Agric. Vict. 1951 : **49** : 13–17.

A large number of introduced soya bean varieties have recently been examined by the Victoria Department of Agriculture, particularly with regard to growth habit and time of maturity. During 1948–49 the most promising were tested for yield at two centres. Notes are given on the characteristics of nine of the most valuable varieties.

2266. Weiss, M. G.,
Weber, C. R.,
Williams, L. F. and
Probst, A. H.
Variability of agronomic and seed compositional characters in soybeans, as influenced by variety and time of planting.
Tech. Bull. U.S. Dep. Agric. 1950 : No. 1017 : Pp. 39.

Tabulated data are presented from two investigations of the influence of planting date on the yielding ability of soya bean varieties varying in date of maturity. The maturity date of beans planted on five different dates, 11 days apart, at three stations in Iowa, Illinois and Indiana was retarded by delay in planting, particularly in genetically early varieties. Those varieties genetically adapted to utilize the entire growing season gave the highest seed yields. Whereas the yields of the earliest variety remained relatively constant for each planting date, those of the latest variety decreased progressively with delayed planting, although seasonal discrepancies affected correlations between planting date and yield for successive years. Different planting dates had no influence on the protein content of the seed which varied with each variety, but the oil content decreased slightly by delayed planting, an effect more noticeable in genetically late varieties. The iodine number of the oil was increased by later planting dates in all varieties.

2267. Gelin, O.
Weibulls original Klosterärt. Vårt lands förnämsta gula kokärt.
(Weibull's Kloster pea. Our country's best yellow processing pea).
Weibulls Ill. Årsb. 1950 : **45** : p. 26.

The well known Kloster [Cloister] variety of pea (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 1454 and Vol. XIX, Abst. 1503) is described. In experiments at Weibullsholm, Sweden, it has surpassed all commercial varieties in quality and yield; and in 67 official trials during 1941–48 it also exceeded the new Torsdagsärt III [Thursday III] (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 139) by 6·5%.

2268. Wells, D. G.
Inheritance and linkage relations of some foliage colour mutants in peas.
J. Genet. **1951 : 50 : 215–20.**

Two natural mutants for foliage colour occurring in the variety Alaska were found to be monofactorial recessive characters, dependent upon genes designated cl_2 and cl_3 respectively. Stocks with cl_2cl_2 were as vigorous as normal plants but had pale green foliage, pods and seeds. Plants with cl_3cl_3 had pale green growing points only. The linkage relationships of cl_2 and cl_3 were determined with respect to linkage groups recently proposed by Lamprecht (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 54). Locus cl_2 was in linkage group IV. The suggested order of factors in group IV is *N–Z–Fa–Td–V–Le–*cl_2. The gene cl_3 was located in group II. The order cl_3*–S–Bl–k* was detected; the position of locus cl_3 with respect to the other genes in group II cannot be determined until its relations with *Oh* and *An* are known. The factor pair *Aa* for development of anthocyanin pigmentation, located in group I, was linked with one of the factor pairs for dimpling of the cotyledons, L_1l_1 or L_2l_2, with a recombination value of $7{\cdot}1 \pm 1{\cdot}2\%$.

2269. Polunin, Ja.Ja.
(Vegetative hybridization of peas).
Agrobiologija (Agrobiology) **1950** : No. **5 : 94–103.** [Russian].

Vegetative hybridization experiments with peas at the Moscow Research Breeding Station of the Institute of Processing Industry are reported. The most satisfactory method was keeping the grafted plant material in flower pots in the glasshouse until the grafts formed a callus. They were then transplanted to the field. This guaranteed a better percentage of unions formed than grafting under field conditions. The latter method however is also regarded as useful because of the greater influence exerted by the stock on the scion. The grafting techniques are described. The late, yellow-seeded variety 14ja Linija [14th Line], bred at the institute, was grafted on James Calvey and on Lord Robert stocks, the aim being to improve its pod size and seed quality and colour for processing. Continuous analytical selection of 14ja Linija for these characters has been unsuccessful. The 500 grafts made gave 35 fertile hybrids and 8 plants which developed from buds formed below the callus. All F_0 hybrids had the stem and pod characters of the scion variety, but showed segregation regarding the seed characters. The seed of two-thirds of the plants was green and more closely resembled that of the stock varieties. Some grafted hybrids between 14ja Linija and Lord Robert produced smooth seed. This character has not been observed in sexually reproduced hybrids between the two varieties. Analysis shows that some grafted hybrids between 14ja Linija and James Calvey had seed weighing 38–54% more than seed of the scion variety, while the seed of other grafts weighed 19–43% less. Some of the vegetative hybrids between 14ja Linija and Lord Robert produced 20–33% larger seed and 19–57% smaller seed than that of the scion variety. The changes in the seed characters regarding the shape, size and colour of the grafted individuals varied in extent. The study of eight grafted plants which developed from shoots below the callus showed that they had the same stems as the plants of the stock type but they differed from those in their seed characters.

In later experiments grafts were made of Ranniĭ Mozgovoĭ [Early Marrow] on Čudo Keljvedona [Kelvedon Wonder], both being early season varieties. The object of this graft was to improve the seed characters of Ranniĭ Mozgovoĭ. The results, which are tabulated, largely confirmed the findings in the previous experiments.

The study of the progenies of the vegetative hybrids between 14ja Linija and James Calvey and between 14ja Linija and Lord Robert showed that many plants were intermediate. However, more plants had the characters of the scion varieties than of the stocks. Some plants were not characteristic of either parent. Some material for instance had trefoil leaves and palmate four sectional leaves on the seventh and eighth internodes. These hybrids are being studied.

Trials showed that the formation of unions depended on the choice of both stocks and scions. The best stock for Ranniĭ Konservnyĭ [Early Processing] was Rostovskiĭ Vysokiĭ,

Rannii Mozgovoĭ did best on Rannii Konservnyĭ, while James Calvey stock formed better unions when grafted with Rannii Konservnyĭ scion than with Rannii Mozgovoĭ.
The experiments with grafted material included vegetative rapprochement of sexual F_1 hybrids from Lord Robert x Štambovyĭ Mozgovoĭ [Determinate Marrow] and from the cross between James Calvey and the F_2 from Štambovyĭ Mozgovoĭ x Ljucengodorovskii. The grafted material is not specified. Promising material has been selected.

2270. Ono, T.
(On the changes in the various characteristics of the plant associated with chromosome doubling in polyploid peas).
Bot. and Zool. 1940 : **8** : 1265–74. [Japanese].

Tetraploid peas were obtained by treatment with acenaphthene. Most of the organs of the tetraploids were larger than those of the diploids but fertility was reduced. Parthenocarpy in the tetraploids was frequent. At meiosis, the tetraploids exhibited metaphase configurations consisting principally of tetravalents but with 2–4 bivalents. Laggards were noticed at anaphase which gave rise to micronuclei. In the subsequent generations of the tetraploids, plants with $2n = 28$–30 chromosomes appeared.

2271. Ono, T.
(Experiments on chromosome doubling by means of acenaphthene treatment).
Bot. and Zool. 1940 : **8** : 39–46. [Japanese].

Polyploidy has been induced in the onion, *Ornithogalum*, hyacinth, *Scilla* and the pea following treatment with acenaphthene. The polyploid pea was selfed and produced six offspring, comprising four tetraploids and two hypertetraploids ($2n = 29$).

2272. Ono, T.
(The production of colchicine-induced polyploids of the pea).
Bot. and Zool. 1940 : **8** : 1627–31. [Japanese].

Colchicine-induced tetraploid strains have been obtained from the three Japanese varieties Kinuzaja [Silky Pod], Usui and Sato [Sugar]. The tetraploids grow more slowly and are less fertile than the diploids.

2273. Wells, D. G.
Inheritance and linkage relations of a crinkled variant in peas.
J. Genet. 1951 : **50** : 230–34.

Genetical investigations were carried out on a type of rogue showing a crinkled condition resembling mosaic, from which the seedlings always seem to recover; the variant has occurred in three crosses having one parent in common, the mutant for foliage colour depending upon the factor pair cl_2cl_2 (cf. Abst. 2268). The crinkled condition developed more strongly at low than high spring temperatures. The character depends upon a single gene pair, designated *crcr*. The factor pair *Crcr* is located in linkage group I, and is linked with *Aa* with a recombination value of $22{\cdot}2 \pm 5{\cdot}7\%$. Since the affected plants ultimately assume normal growth, the occurrence of the variant is of little commercial importance.

2274. Mattson, S.,
Åkerberg, E.,
Eriksson, E.,
Koutler-Andersson, E. and
Vahtras, K.
Factors determining the composition and cookability of peas.
Acta Agric. Scand. 1950 : **1** : 40–61.

In a previous study it was found that the cooking capacity of peas depends upon the content of inositol hexaphosphoric acid or phytin. The effect of the following factors

upon the composition and cooking quality of peas has been investigated: monovalent and divalent cations and phosphates, neutral salts, soil and climate, variety, ripeness, and storage at different humidities. Varieties grown on the same soil differ somewhat in phytin content and in cooking quality but these differences are not outstanding.

2275. LAMPRECHT, H.
The degree of ramification in *Pisum* caused by polymeric genes.
Agri Hortique Genetica, Landskrona 1950 : **8** : 1–6.

Data have been obtained suggesting that degree of branching of the stem in the pea is conditioned by at least two gene pairs, *Frfr* and *Frufru*. The different genotypes are difficult to distinguish. Recessiveness in both gene pairs results in the highest degree of branching. Both environmental and genetical factors are regarded as responsible for the great variation in stem branching. Owing to this variation the gene pairs *Frfr* and *Frufru* are unsuitable for linkage studies.

2276. HÄRSTEDT, E.
Über die Vererbung der Form von Laub- und Kelchblättern von *Pisum sativum*. (**On the inheritance of the shape of leaves and sepals of *P. sativum*).**
Agri Hortique Genetica, Landskrona 1950 : **8** : 7–32.

In contrast to previous work on abnormal, wild-type rogues, in the present experiment the length/breadth index of stipules, leaflets, and the two upper and three lower sepals in two lines of peas with normal, i.e. rounded leaf tips, was studied.
Incidentally the segregation of the factors *N–n* (normal v. thick walled pod), *V–v* (membranous v. membrane-free pod), *R–r* (round v. wrinkled seed) and *I–i* (yellow v. green cotyledon) was observed.
The length/breath index of the stipules, leaflets and sepals proved to be due to a pleiotropic effect of three genes, *fo*, *fob* and *fol*, all three of which exhibited marked, but not complete, dominance.
Fo showed rather strong linkage with *N*, but weak linkage with *V* (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 54).

2277. GILPATRICK, J. D. and
BUSCH, L. V.
Studies on the pathogenicity of different isolates of *Ascochyta pisi* Lib.
Plant Dis. Reporter 1950 : **34** : 383–87.

Investigations carried out in Canada on the reactions of pea varieties to isolates of *A. Pisi* are reported. Data for the pathogenicity of 7 isolates on 8 pea varieties and *Vicia villosa* indicate that at least three physiological races of the fungus exist. The peas *OAC* 181, Scotch and A–100 appear to have some resistance. In breeding for resistance to *A. Pisi*, testing for reaction to as many isolates as possible is recommended.

2278. WARK, D. C.
The inheritance of resistance to *Ascochyta pisi* Lib. in *Pisum sativum* L.
Aust. J. Agric. Res. 1950 : **1** : 382–90.

The reaction of spray inoculated seedlings of over 200 varieties of *Pisum sativum*, to *Ascochyta Pisi* was tested at Canberra; they are listed according to their relative susceptibility. Austrian Winter proved most resistant and was crossed with several other varieties. Observations of the F_1 and F_2 generations indicate that resistance is due to the presence of three dominant Mendelian factors. This conclusion was supported by three generations of back-crossing the progeny from the cross Austrian Winter x Greenfeast,

with Greenfeast as the recurring parent. All the resistant progeny obtained during the investigation inherited the undesirable characters of Austrian Winter, viz. small pod size, with wrinkled seeds of late maturity.

2279. HAGEDORN, D. J.
The reaction of Perfection-type peas to Wisconsin bean virus 2 isolates from pea.
Phytopathology **1951 : 41** : p. 15. (Abst.).

The reactions of 36 varieties of the type Perfection to four different isolates of bean virus 2, obtained from peas growing in Wisconsin, were studied in the greenhouse. Most varieties, including Wisconsin Perfection, were resistant but eight were susceptible to at least one isolate.

2280.
New sweet corn hybrid has exceptional quality.
Crops and Soils **1951 : 3** : No. 6 : p. 32.

The new hybrid sweet corn Golden Jewel, developed at the Massachusetts Agricultural Experiment Station, is briefly described. It is characterized by a season of maturity midway between Marcross and Carmelcross, large ears and good quality.

2281.
Better sweet corn is goal of Purdue men.
Crops and Soils **1951 : 3** : No. 5 : p. 25.

The new sweet corn hybrid Hoosier Gold, with earlier maturity and a longer ear than Golden Cross Bantam, is to be released by the Indiana Agricultural Experiment Station.

2282. HASKELL, G. and
SELMAN, G. G.
Studies with sweet corn. III. The primary effects of treating seeds with ultrasonics.
Plant and Soil **1950 : 2** : 359–73.

Inbred lines of the sweet corn types C4 and P39 were used to investigate the primary effects of seed treatment with ultrasonic waves. Treated seeds were planted at the John Innes Horticultural Institution, England, and it was found that the percentage germination was lowered in both varieties, probably through infection by *Pythium Debaryanum* and other fungi and bacteria, the testas having apparently been damaged during treatment. Statistical analyses in respect of earliness, height, extent of tillering and number of leaves on the main stems showed no significant differences between treated and untreated material of either variety.
It was concluded that ultrasonic waves have little value for maize production in England, although they might contribute towards heterosis through mutations controlling degenerative changes (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 752). Such an application would only be feasible after the limit is reached in improvement of hybrid maize by selection of inbred combinations.
Ultrasonic induction of mutation is less reliable than the use of X-rays.

2283. HASKELL, G. and
DOW, P.
Studies with sweet corn. V. Seed-settings with distances from pollen source.
Emp. J. Exp. Agric. **1951 : 19** : 45–50.

Sweet corn plants, spaced 4 ft apart in 8 stringers which radiated from a central block forming the pollen source, were grown to study the factors affecting seed setting in hybrid

production. A hybrid variety, Seneca 60, was used in order to reduce interplant variation. The regression of log (mean percentage seed set) on distance from pollen source was a straight line. Seed set between stringers showed no significant differences but distance from source was highly significant. Seed setting dropped to 95% at 12 ft. from the pollen source. The data indicate that the number of seed rows between pollen rows in hybrid seed plots could be increased from 2 to 5, with a row spacing of 2 ft, without reducing seed yield. Row direction is not an important factor in small plots.

2284. Moore, E. L.
Sixteen sweet corn varieties compared.
Miss. Fm. Res. 1950 : **13** : 5, 8.

The sweet corn Aristogold Bantam Evergreen is still recommended for commercial production in Mississippi; although it is slightly outyielded by several other varieties and hybrids its ears are the most suitable for the processing industry. Oto, Golden Security, Golden Hybrid 1734 and Tristate are recommended for the domestic garden.

2285. Frew, S.
Pop corn: a Marlborough venture.
N.Z. J. Agric. 1951 : **82** : 39–45.

An account is given of the recent expansion of popcorn production in Marlborough, NZ. Hybrid seed is now produced locally by crossing strains introduced from the United States.

2286. Horel, J.
Moravský koriandr. (**Moravian coriander**).
Věstn. Čsl. Akad. Zeměd. 1950 : **24** : 556–58.

The results of biochemical analyses of a recently developed variety of Moravian coriander, *Coriandrum sativum*, are reported.

BOOK REVIEWS

PATTERSON, A. M.
A German-English dictionary for chemists.
John Wiley & Sons, Inc., New York and Chapman & Hall, Ltd., London
1950 : 3rd ed. : 40s. : Pp. xviii + 541.

Patterson's dictionary must by now be well known as one of the best technical dictionaries for English-speaking scientists and research workers who have to read or consult scientific papers in German. It now reaches its third edition which contains about 50,000 words. To those not familiar with former editions the following information will be of interest.

In spite of its title, the range of this work goes far beyond the field of chemistry and includes, in addition to a large general vocabulary (an unusual but useful feature in a technical dictionary), terms relating to biology, botany, physics, geology, pharmacy, crystallography, and other branches of pure or applied science and industry. The general vocabulary includes (1) many terms which have also technical meanings; and (2) abbreviations found in German chemical literature but not in English.

The introduction advises the reader how to use the book, drawing special attention to the peculiarities of German chemical nomenclature, and provides information on variants in spelling, noun endings, grammatical points and prefixes and suffixes, so important for the understanding and translation of those portmanteau German words, which can be so troublesome to beginners or readers who hope to use the language for purely practical purposes.

Many obsolete or antiquated chemical terms are defined to assist anyone reading the older literature and, where there is any possibility of confusing them with modern meanings, they are marked as "old" or in some other way.

PERRY, J. W.
Scientific Russian. A textbook for classes and for self-study.
Interscience Publishers, Inc., New York and London 1950 : $7.50 :
Pp. xxix + 816.

Professor James W. Perry is known to many readers as a chemist, to others as an authority on coding, ciphering and punched-card techniques. His new work on *Scientific Russian* shows him also to be a very competent authority on the study of language, and the way in which he has treated the most difficult task of making the intricacies of the Russian language sufficiently clear not to discourage an average scientist will undoubtedly earn him the thanks of this large section of humanity, notoriously devoid of linguistic ability yet thirsting for first-hand knowledge of the achievements of their Soviet colleagues. The plan on which the course of study is devised will commend itself to the scientist with no previous knowledge of Russian, for the first few lessons contain almost exclusively words that are more or less the same in English and Russian. The reader is led very gradually through graded exercises up to the more alarming complexities such as irregular verbs, perfective and imperfective aspects, comparatives and numerals. The attempt at simplification sometimes leads to an appearance of difficulty when none really exists, as in the treatment of some types of verb with modified infinitives, where the impression is given rather that the infinitive is normal and the entire conjugation irregular. The only real inaccuracies occur in the accentuation of the Russian text. The provision of an accented text in the examples and the exercises is an invaluable adjunct for students wishing to get some idea of how the Russian sentences are spoken as well as written; it is regrettable therefore that in this respect the text is not entirely free from errors. The distinction between ë and accented e is also frequently omitted.

The majority of the examples deal with chemical or physical subjects and consequently, though there are a few sentences in which plants and animals are mentioned, the work will be less valuable to students of biology than to those of the mechanical sciences. A companion volume with examples drawn from biological literature would undoubtedly be welcome.

The volume is produced by a photo-offset process from typed pages, and apart from the errors in accentuation referred to already, is commendably accurate, though a few

typographical errors, in addition to those referred to in the *errata*, still remain in both the English and Russian texts and some at least of the references to other pages are incorrect. With these few, very minor, reservations, the book can be recommended as a good and reliable starting point for scientists wishing to embark on a study of that fascinating subject, the Russian language.

Catalogue of Lewis's Medical, Scientific and Technical Lending Library.
H. K. Lewis & Co., Ltd., London 1950 : 35s. : Pp. xii + 1152.

This new edition of this useful reference book (cf. *Plant Breeding Abstracts*, Vol. XV, p. 372), as revised up to the end of 1949, contains about 27,000 titles of a wide range of works available in Lewis's Medical, Scientific and Technical Lending Library which, allowing for duplicates, probably has about 90,000 volumes in circulation.
As in the previous edition, the contents are divided into three main sections: Part I, authors and titles; Part II, a classified list of subjects, based on the names of the authors who have written upon them, and showing at a glance the number of publications indexed on any particular subject; and Part III, an alphabetical list of subject headings. There is also a list of annual periodical publications and reports that are automatically added to the library as published.
The working of the library and the service to borrowing members are explained in the preface.

Roemer, Th. and
Rudorf, W.
Handbuch der Pflanzenzüchtung. (**Manual of plant-breeding**).
Paul Parey, Berlin and Hamburg 1950 : Vol. V : Lief. 27 : Bogen 19–23 : 289–368 : figs. : tables; Lief. 31 : Bogen 24–32 : 369–508 : figs. : tables.

The last two parts of this admirable monograph (cf. *Plant Breeding Abstracts*, Vol. IX, p. 482 and Vol. XX, p. 595) have now appeared, completing Volume V. They contain sections, composed on lines similar to those of the earlier numbers, devoted to garden brassicas by H. Lamprecht, garden peas by H. Heyn, lettuce by A. H. Bremer, radishes by G. Becher and P. Vogel, celery by S. Becher and P. Vogel, cucurbits by L. A. Schlösser, and tomatoes by J. Hackbarth. The last part ends with a subject index, contents and title page for Volume V. The high standard associated with the earlier numbers has been maintained.

Kuckuck, H.
Entwicklung und Probleme neuzeitlicher Pflanzenzüchtung. Mendel oder Lyssenko.
(**Development and problems of modern plant breeding. Mendel or Lysenko**).
Paul Parey, Berlin 1951 : Pp. 75.

In connexion with the 50th anniversary of the rediscovery of Mendel's laws, his work in editing a German translation of Lysenko's Agrobiology, and a sojourn of several months in Sweden, the author has been called upon to deliver a number of lectures on these subjects and since the matter discussed is of importance for the practical success of plant breeding not only in Germany but elsewhere, the lectures have been published together in one volume, comprising the following chapters:—

Lyssenkos Genetik und ihre Anwendung in der Pflanzenzüchtung. (*Lysenko's genetics and its application in plant breeding.* (*pp. 7–20*).

The essentials of Lysenko's views on heredity are presented clearly and succinctly. It is pointed out that most of Lysenko's criticisms of genetics are applicable only to its early

stages and that the contributions of geneticists during the last few decades are entirely ignored; that there is an astonishing lack of controls in the experiments of both Mičurin and Lysenko, which makes it impossible to evaluate their results on a truly scientific basis; that the change from winter to spring habit has been obtained by other breeders in cross-pollinating plants like rye but never with genetically pure material; that many of the older German cereal varieties such as Rimpaus Früher Bastard [Rimpau's Early Hybrid] are just as productive to-day as they were thirty or forty years ago; that Lysenko's figures for yield differences resulting from intravarietal hybridization are statistically not significant; and that he suggests no method for the solution of other problems such as the production of sweet, nonshattering lupins, stringless beans or wheats of higher baking quality, all of which have been achieved by classical genetical methods.

The author agrees with Lysenko that many breeders have engaged in academic studies unnecessarily remote from practical problems and that the importance of cultivation measures in supplementing the effect of desirable hereditary characters has been neglected.

Die Entwicklung der Pflanzenzüchtung in Deutschland von 1919 bis 1939. (*The development of plant breeding in Germany from 1919 to 1939*). *pp. 21–32*).

An outline is given of the organization and achievements of plant breeding in Germany during the period. Single plant selection is still capable of giving improvements in certain groups of plants that have not yet been subjected to intensive breeding work, for instance forage plants and vegetables. However, the wide use of modern breeding methods has caused an increasing tendency for plant breeding to pass out of the hands of private breeders or breeding firms into the state institutes. The Halle institute alone has produced 18 new cereal varieties which include many of the most extensively cultivated varieties in the whole of Germany. The state institutes also supply hybrid material for use as parents.

Among the achievements mentioned as being most important are the winter wheat Carsten V, which has come to be grown in a wide range of environments; the spring wheat Koga, which is an A quality wheat yielding 19% more than the previous standard, Peragis, and possessing also field resistance to brown rust; mildew resistant barleys produced at Weihenstephan, yielding 30% more than the ordinary varieties in years of bad attack; stiff-strawed barleys such as Haisa and Donaria, yielding 3% more grain than Isaria; naked barleys with high protein content; nonshattering sweet lupins with soft seeds; the potatoes Flava, Aquila and others, resistant to late blight and to virus degeneration; heterosis seed of sugar beet from Kleinwanzleben, yielding 8% more sugar than the beets grown previously; sugar beets resistant to *Cercospora;* the dual purpose flax Roland; monecious hemp with high yields of both seed and fibre, the direct result of genetical studies on sex determination and inheritance; and canning peas and French beans improved materially in yield and quality. Reference is also made to extensive work in fruit trees and forest trees by modern breeding methods, the results of which are just beginning to come to effect; among these are hybrid poplars with rapid growth and pines resistant to *Brunchorstia destruens.*

Neuere Methoden der Pflanzenzüchtung. (*The new methods of plant breeding*). (*pp. 33–45*).

The first example of modern breeding methods is the modification of the old-fashioned selection process to suit special purposes, as in the Petkus method of retaining part of the seed of promising lines to use as pollinating material in the following year; and the use of back crosses.

The most useful of the strictly modern methods is thought to be the use of heterosis, and the various genetical processes that have been adduced as explanations of heterosis are explained. It is thought possible that all may contribute, in varying degrees in different plants, and even in different lines. American maize hybrids have yielded up to 37% more than Dr. Dellile's maize, the German standard, which they also exceed by 9 days in earliness. The use of heterosis led to an increase of 8% in the sugar yield from Kleinwanzleben sugar beet between the years 1927 and 1936 and the opinion is expressed

that equally favourable effects can be expected from the application of this method to other cross-pollinating plants.
The use of artificial mutations is exemplified by a mutant of Haisa barley which is 6 days earlier than the original line and surpasses it by 10% in yield.
Artificial polyploids are considered disappointing and their use is recommended only in conjunction with a thorough knowledge of the genetical composition of the initial diploids, as it is this that chiefly decides whether chromosome duplication will lead to improvement or deterioration.

20 Jahre Pflanzenzüchtung in Müncheberg. (*Twenty years of plant breeding at Müncheberg*). (*pp. 46–53*).

In outlining the achievements of the Müncheberg institute for breeding research, it is noted that not only were new methods elaborated and put to practical use, as in the study of artificial mutations in snapdragons and the production of a high yielding early mutant from Haisa barley, but the common methods of selection and crossing were applied on a new scale, which led for instance to the production of sweet lupins with white seeds, soft seed coat, freedom from shattering and luxuriant growth, as the result of the examination of over 10 million plants: a wild plant was converted in only 20 years to a cultivated plant, the scientific basis of the process being Vavilov's law of homologous variation.
The vine hybridization work, in which millions of seedlings were tested every year, is being resumed and there is reason to believe that the goal of introducing the mildew and *Phylloxera* resistance of American species into the European vine will be achieved. By similar methods it has been possible to produce apples combining hardiness, scab resistance and low cultural requirements with high dessert quality and keeping capacity; hardy self-fertile plums; early ripening sweet cherries of high quality; very productive early strawberries of high dessert quality; large-fruited mildew-resistant gooseberries; and hybrid poplars with much increased growth rate. Hemp hybrids with simultaneous ripening of male and female plants are already being tested and multiplied, and hybrid material of a great number of crops has been made available to commercial breeders for use as parents.

Pflanzenzüchtung in Schweden. (*Plant breeding in Sweden*). (*pp. 54–69*).

The system of plant breeding in Sweden is said to exemplify a golden mean between the system of privately owned breeding stations without state aid as found in the western zone of Germany and the entirely state-controlled system as found in the eastern zone. Other advantages of the Swedish system are mentioned in a general account of the Svalöf institute and its development, its substations and its achievements, of the institutes for forest tree breeding and for fruit breeding, and of private undertakings such as the Weibull company and the Hilleshög sugar beet institute.
Particular attention is called to the use of the polycross method, at Svalöf with clovers, by means of maintaining the mother seed in nitrogen, so that those which have given the best progenies can be used as parents in a polycross for seed production, at Hilleshög with sugar beet, and at the tree breeding institute with forest trees. Practical results have accrued from the extensive experiments with colchicine in the form of tetraploid *Trifolium hybridum* strains which are now in cultivation and have given up to 30% increases in yielding capacity. These experiments have made it clear that the value of the tetraploids depends very much on the genetical composition of the parent lines and that careful selection is necessary both before and after treatment with colchicine. Triploid sugar beet seed is being produced commercially at Hilleshög and is giving good results in practice, with a yield increase of 5% over the Hilleshög standard. In fruit trees some 2000 triploid seedlings have been produced by crossing tetraploid x diploid, and the same process is now being applied in forest trees. The Swedish results with X-ray mutations in barley are in complete agreement with those at Halle in Germany, and important further developments are foreseen from the new experiments in which radioactive phosphorus is used.
In conclusion it is pointed out that the whole practical success of the plant breeding work in Sweden is ascribable to the fact that it was founded on sound Mendelian principles from its inception in 1900, when Nilsson-Ehle became director of the Svalöf institute.

Nachwort. Die Ausbildung der Pflanzenzüchter und die Organisation der Pflanzenzüchtung in Deutschland. (*Conclusion. The education of plant breeders and the organization of plant breeding in Germany*). (*pp. 70–75*).

In his closing remarks the author contrasts the system of plant breeding in Germany to-day unfavourably with the rational system found in Sweden, since in the western zone there are no state institutes, and in the eastern zone the Lysenko school holds almost undisputed sway, there are few genetically qualified breeders still operating and the partition of the land has made the maintenance of pure stocks of seed well-nigh impossible.

GRÜNEBERG, H. and
ULRICH, W.
Moderne Biologie. Festschrift zum 60. Geburtstag von Hans Nachtsheim. (**Modern biology. Volume in celebration of the 60th birthday of Hans Nachtsheim**).
F. W. Peters, Berlin 1950 : Unbound DM 39, Bound DM 43 : Pp. 287 : figs. : tables : plates.

The special volume celebrating Professor Nachtsheim's sixtieth birthday begins with an appreciation of the man and his work by W. Ulrich. Then comes a list of his published works, followed by a series of articles contributed by distinguished scientists working in the many fields in which Professor Nachtsheim's researches have been pursued. Most of the contributions deal with problems of animal or human genetics but there is one by H. Kappert on "*Botanische Untersuchungen zur Erblichkeit der Polyembryonie*" (*Botanical investigations on the inheritance of polyembryony*), in which figures are given showing that flax plants of a line characterized by a high proportion of polyembryonic seeds gave a significantly greater proportion of such seeds when selfed than when pollinated with pollen from normal plants; the pollen of the polyembryonic plants however did not increase the amount of polyembryony when used to pollinate normal plants. By selection of the plants with the largest proportion of twin seedlings in their progeny the percentage of twinning was increased from 0·07% to 21·4% in 8 generations, starting from the F_1, in one line of a Stockholm x Weimar hybrid, whilst little or no increase occurred in some other lines, suggesting that twinning is conditioned by a number of recessive characters. A clear correlation was seen to exist between the proportion of polyembryony and the proportion of haploid seedlings. Thus in a line with high twinning the proportion of haploid-diploid seedlings was 0·52% and in a corresponding low twinning line only 0·11%.
It is pointed out that these results may have a bearing on the study of the inheritance of twinning in humans.
The last contribution is by Sewall Wright on "*Population structure as a factor in evolution*," in which three different points of view on the genetic aspects of evolution are examined: a steady process of microevolution in which higher systematic categories are built up from lower ones under the influence of selection by the slow accumulation of small favourable changes; macroevolution in which the dominating process is regarded as the abrupt origin not only of species but also of higher categories by major mutation, with lower categories arising from higher ones; or an irregularly shifting state of genetic balance. The latter constitutes the author's well-known hypothesis, in which the most important immediate factor in evolution is regarded as ecological opportunity rather than small or large genetic changes. Factors providing the basis for the shifting states of genetic balance upon which evolution depends, modes of change of gene frequency, modes of transformation within species and the phases in a macroevolutionary cycle are discussed. (cf. Absts. 35 and 53).

LWOFF, A.
Problems of morphogenesis in ciliates.
John Wiley & Sons, Inc., New York and Chapman & Hall, Ltd., London 1950 : $2.50 : Pp. ix + 103 : 32 figs.

As a development from an original lecture on *Visible self-reproducing cytoplasmic granules in the life cycle of some parasitic ciliates* this monograph outlines several problems, related

to the ciliates, which can be used to substantiate Dr. Paul Weiss's theoretical conceptions of molecular ecology. Chapters considering various aspects of kinetosomes, including their division, differentiation and genetic continuity, in addition to their activity during phases of torsion and reproduction of the individual, are detailed and well illustrated. The monograph, which reflects authoritative knowledge gained from thirty years' association with the study of ciliates, including the "most stirring" experience of "watching a ciliate stopping in his search for food to look at you through the microscope," conforms with the production standards of the Wiley biological research series.

ARNON, D. I. and
MACHLIS, L. (EDITORS)
Annual Review of Plant Physiology. Volume I.
Annual Reviews, Inc., Stanford, California, USA 1950 : $6.00 : Pp. ix + 364 : figs. : tables.

Since the launching of the *Annual Review of Biochemistry* in 1932, it has been the practice to include among the review articles a few chapters devoted to advances in important fields in plant physiology. Increasing activity in this subject "brought in year by year new demands for greater space allocation," which the *Annual Review of Biochemistry* felt unable to grant. In 1947, plant physiologists in the United States agreed that it would be desirable to establish a separate *Annual Review of Plant Physiology*. It must remain a matter for congratulation that the late Professor D. R. Hoagland, who had for years cherished the idea of founding such a volume, should have participated during the last two years of his life in the planning of the new project.

In their preface to the first volume of the new series, the editors announce that they "seek to provide annually a critical evaluation of all branches of plant physiology," special consideration being given to subjects bordering on several disciplines (such as soil and plant interrelations, physiological anatomy and physiological ecology). It is their hope that the new *Review* will aid in the knitting of closer ties between physiologists active in diverse fields of research. There is not the slightest doubt that all workers "attempting to keep abreast of significant developments in the major discipline" will find much of interest in the pages of this volume. There are chapters devoted to carbon dioxide fixation by green plants, the transformation of sugars, the physiology of cell wall growth, the respiration of higher plants and the water relations of cells and tissues, all fields of academic research in which the "ever-growing volume of activity" in recent years has been phenomenal. To those working with crop plants, the chapters dealing with soil moisture, mineral nutrition, growth regulating substances and the influence of light on plant growth may be expected to make a special appeal. Here in fact is a rich fund of information, including not merely discussions on lighting arrangements in greenhouses (p. 55) and the possibility of relating results obtained with potted plants with those obtained during field trials (p. 290), but also valuable summaries of chromatographic technique (p. 238) and the accepted crystal structures of alumino-silicates (p. 327).

The majority of the authors have succeeded admirably in providing "a critical assessment of the state of knowledge in their selected field." Whereas a few of them have been content to present highly condensed summaries of researches carried out within rigidly fixed time limits, the majority have very skilfully selected papers illustrating the more prominent fields of advance, and have presented in polished essay form a "critical appraisal of the present status of their subject."

When one considers the wealth of fact packed into the 364 pages, the number of errors which have crept into the final text is astonishingly small. There are, however, one or two statements which should not be exposed to bright sunlight. Thus, on p. 8, we read that "only one-fourth of the anion respiration can be *accounted for* by anion absorption"; on p. 180, that "cell elongation is a cytological *revolution*"; and, on p. 115, that "the concentration of water will be enormously increased in aqueous medium." It is surely unwise to "*ascribe*" almost every important physiological process in the plant to potassium; (p. 10) and it may be questioned how often "*simple*" diffusion takes place in plant tissues (p. 12).

But these are very minor blemishes in an outstandingly successful venture. There is little doubt that the new *Review* will take its place in the library of the research worker as an indispensable work of reference. J.P.R.R.

STILES, W.
An introduction to the principles of plant physiology.
Methuen & Co. Ltd., London 1950 : 2nd ed. : 60s. : Pp. x + 701 : 64 figs. : 123 tables.

We must count ourselves fortunate that Professor Stiles has found time in a busy life to prepare a revised edition of his well-known "Introduction to the Principles of Plant Physiology." During the fifteen years which have elapsed since the appearance of the first edition, this book has established itself as a standard text among "students of botany reading for pass and honours degrees," and has proved a useful work of reference for those "wishing to consult original sources."

The familiar layout remains unchanged; there are four major sections, concerned with the general physiology of the cell, with metabolism, with the physiology of development and with problems of irritability and movement of plant organs. But in view of the vast output of research work in the subject since 1936, the year when the first edition appeared, it has been felt necessary to introduce new paragraphs into most of the chapters. The long bibliography at the end of the volume contains as many as 250 new references, an increase of 25%. Nevertheless Professor Stiles has succeeded in inserting the information into his text so skilfully that the number of pages has increased by no more than 12%.

Confronted with such a feast of dialectic, Oliver Twist himself would be shamed to silence. The reviewer may perhaps be pardoned for pointing out a few errors which have crept over from the first edition. It is misleading to state that "starch is insoluble in water" (p. 245), and dangerous to assume that "in general the formation of storage substances from the mobile substances of translocation is brought about by the synthetic action of the same enzymes (as those promoting hydrolysis), *there being evidence that* enzyme action is reversible" (p. 320). It is indeed extremely unlikely that "the synthesis of sucrose and inulin may be effected by the enzymes sucrase and inulase . . . catalysing in the direction of synthesis" (p. 245). Readers interested in the "chemical changes taking place in the plant body" will presumably refer to textbooks of plant biochemistry, where they will learn that lucein is not a xanthophyll (p. 231) and resins are not complex carbohydrates (p. 246). They will at the same time have an opportunity to check the formulae of oleic acid and the phytosterols (p. 248), and they may pass on to discover the recent work on intermediate metabolism.

Plant breeders will doubtless turn to the section on the physiology of development, in the hope of finding there some integration of the results of analytical work discussed earlier in watertight compartments. And here it must be confessed that the usefulness of this introductory account may prove to be strictly limited. During the last hundred years, plant physiologists have in the main been occupied in establishing the outlines of the more important chapters of metabolism, often without attempting to stand back and survey the miracle of the intact plant. That some kind of integration is possible, there are already many exciting pointers. All workers interested in the growth of plants must be conversant with the adventures of the ubiquitous plant hormones, and aware of the fundamental importance of the concept of limiting factors (p. 214). But the plant breeder concerned to know the effect on the growth and development of crop plants of seasonal changes of the environmental factors, and the ways in which they may be expected to influence overall yield, (or for that matter quality) must learn to explore for himself the voluminous literature and piece together the widely scattered clues. To many of his enquiries the orthodox plant physiologist will be unable to provide a clear-cut answer. For instance, the processes of lignification in stems of cereals have seldom been studied, and scarcely anything is known about changes in metabolic rates following changes of turgor. In elucidating the factors promoting resistance to attack by microorganisms, it may well be that present-day knowledge of cutinized walls and cytoplasmic organization in the host plant will prove inadequate. But before any of these complex problems can be intelligently discussed, it will be necessary to clarify our ideas on the basic principles of plant

physiology. It is in this connexion that Professor Stiles's "*Introduction to the Principles of Plant Physiology*" will find its major application. For as a teacher of many years' experience, wise and patient and stimulating, Professor Stiles is surely unsurpassed.

J.P.R.R.

MANSFELD, R.
Die Technik der wissenschaftlichen Pflanzenbenennung. (**The technique of botanical nomenclature**).
Akademie-Verlag, Berlin 1949 : Unbound 12.50 DM, Bound 14 DM : Pp. 116 : 6 plates.

In this short book of just over a hundred pages, the author provides a clear and straightforward introduction to the way in which the International Rules of Botanical Nomenclature are used for naming plants. After a brief historical introduction covering the pre-Linnean systems and an interesting excursus on other systems that have been rejected in favour of the Linnean system, the author describes how Linnaeus stabilized nomenclature and how subsequent International Botanical Congresses—the last mentioned is the Amsterdam Congress—have codified subsequent nomenclatural practice in the International Rules. Most of Dr Mansfeld's book is taken up with a suitably glossed account of the Rules, providing in this way a rather more readable treatment than the Rules themselves. A glossary follows on the technical terms of botanical systematics, and the whole work is concluded by a chapter on the ways in which the Rules contribute to resolving nomenclatural problems, and another on the usefulness and otherwise of vernacular names. Though raising few points not already ventilated in the English taxonomic literature, Dr Mansfeld's book provides a useful introduction to the subject for German readers, and may be recommended to students specializing in plant taxonomy.

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HUNTER, H.
Crop varieties.
E. & F. N. Spon, Ltd., London 1951 : 21s. : Pp. xiv + 224 : 24 figs. : 35 tables.

Nobody is better equipped than Dr Hunter to write on the varieties of crop plants dealt with in this volume. He has himself been responsible for the production of some of them and actively associated with the work on others, in the various periods of his career: in Northern Ireland with flax and barley, at the Cambridge Plant Breeding Institute with oats, and at the National Institute of Agricultural Botany with rye and other cereals. This first hand knowledge of the objects dealt with is reflected in the presentation, and the book, far from being a mere description of crop plant varieties as its title would suggest, proves to be a most readable account of their origin and production.

Barley is treated first, and we are given a vivid account of the pioneer breeding work at the turn of the century which led to the production of the famous varieties such as Chevallier, Goldthorpe, Archer and Prentice (Danish Archer); then of the first hybridization work which led to Spratt-Archer, Plumage-Archer and a series of later hybrids. How successful this early work was can be judged from the fact that Dr Hunter's Spratt-Archer occupied as much as 77·2% of the area sown to barley in the eastern counties of England in 1944 and is still holding its own. Equally clear accounts are given of how the famous series of Scandinavian barleys, starting with Binder and Gull [Yellow] and leading to Kenia and Maja and the rest, arose in Denmark and Sweden.

The barley story is paralleled in the following chapter by the wheat story, where the pioneer work was that of Biffen in the production of Yeoman and the high yielding quality wheats, and in the next by the oat story, where the outstanding production was the Victory oat at Svalöf. Brief chapters are devoted to rye and to field beans and field peas, and then Chapter VII presents the flax story, which with the breeding of the famous Stormont and Liral series in Northern Ireland closely parallels the stories of the cereals. In every case disease resistance has been one of the main problems facing the breeder and

the course of later breeding work is outlined. The main agricultural varieties grown in Great Britain are described briefly and illustrated.
There follows a useful account of the systems of cereal seed certification adopted in Great Britain and in Denmark, and the final chapter, written by Dr. G. P. Carson, is devoted to the potato. It gives an outline of the history of the potato in Europe, a description of the principal British varieties, and information on the most important potato diseases and the advances that have been made in combating them by breeding resistant forms.
The volume, though not entirely free from typographical and grammatical errors, is interestingly written, well indexed and well illustrated, and each chapter is furnished with a selected bibliography.

DUNGAN, G. H. and
BOLIN, O. E.
Judging crop quality.
Interstate Printers and Publishers, Danville, Illinois 1950 : $3.00 :
Pp. 288 : 125 figs.

Chapters describing the various characters making for good quality are given on the following, with reference to requirements in the United States: barley, broomcorn brush, buckwheat, shelled maize for seed purposes, ear seed maize, commercial maize, cotton fibre, cowpeas, flaxseed, forage grass seed, hay, small-seeded legumes, oats, potatoes, rye, sorghum seed, soya beans, tobacco, vegetable crops and wheat. The valuable work of the Crop Improvement Associations and of similar groups in Canada, outlined in chapter 22, requires the full cooperation of farmers and growers in the general task of improving crop quality. For this the farmer himself must have adequate knowledge of the characters shown by good seed or crops. *Judging crop quality* is written not only for judges at shows but also for agricultural students and farmers as a guide to evaluating the standard of crops on the farm and to judging samples in the class room. It is clearly written, well indexed and generously illustrated.

PEACHEY, R. A.
Cereal varieties in Great Britain.
Crosby Lockwood & Son Ltd., London 1951 : 21s. : Pp. 202 : illus.

This handsome volume contains illustrated descriptions of the main varieties of wheat, oats and barley grown in England. The descriptions, it is stated, are based on five years' observations and trials on the majority of the varieties mentioned, together with data collected from the farming community; some recent introductions have been included with the aid of the breeders' descriptions. The observations were carried out on light land almost in the centre of England and the photographs which accompany the descriptions were all made there on the original material.
The section devoted to wheat, after a general discussion of the many factors that contribute towards a good crop, describes the diagnostic characters thought most suitable for recognizing agricultural varieties.
The varietal descriptions follow, information being given on the origin, agricultural characteristics, resistance to disease and other adversities, quality, and general morphological features of the plant, ear, straw and grain.
The sections on oats and on barley follow and are on similar lines.

GITHENS, T. S.
Drug plants of Africa. African Handbook No. 8.
University Press, Pennsylvania and Geoffrey Cumberlege, London 1948 :
18s. : Pp. vii + 15 tables.

More than two-thirds of this handbook consist of tables of those members of the African flora which are loosely termed drug plants, listed according to the chemical nature of their products and their method of utilization; other lists include principal exports, generic

synonyms and definitions of medical terms. These tables show the wide diversity of drug plants and the important contribution of Africa to pharmacology; they indicate the careful work of investigating collections from various regions, eliminating duplications and checking inconsistencies which has produced a survey of the whole continent, with nomenclature based on the *Index Kewensis.*

A preliminary explanation of the tables includes a short chapter on the utilization of drug plants in Africa, divided for convenience into four groups: plants whose medicinal use is of secondary importance compared with uses in other connexions; plants which are not indigenous but are cultivated for local use or export; plants which are used by the natives as arrow poisons or as ordeal and homicidal poisons; and indigenous and introduced plants used by the natives to treat ailments and as fish poisons. Another short chapter deals with the chemical basis of drugs with examples of groups such as mucilages, gums, alkaloids, fats, essential oils, glucosides and resins, for the benefit of those unfamiliar with plant chemistry; the absence of chemical formulae, which might confuse readers in the latter category, will be interpreted by the student or expert as either an agreeable assumption of the obvious or an omission of the essential.

Garoglio, P. G.
Tecnología de los aceites vegetales con especial referencia al aceite de oliva. (**Technology of vegetable oils with special reference to olive oil**).
Ministerio de Educación, Universidad Nacional de Cuyo, Mendoza (República Argentina) 1950 : Pp. 1284 : figs. : tables.

A treatise on oil technology, with special reference to olive oil, due to be published in Florence in 1944, was almost completely destroyed by war action and has been reassembled, amplified and brought up to date by the author while working as a guest of the National University of Cuyo in the Argentine Republic, under whose auspices it has now been published in Spanish. Chapter 1 deals with statistics of production and consumption, chapter 2 with chemical composition, chapter 3 with the mechanism of oil formation in seeds and fruits, and succeeding chapters with rancidity, chemical and physical properties, methods of analysis, identification, extraction, refining and utilization of vegetable oils and by-products. The final chapter is devoted to oils and fats of animal origin.

The volume is well printed and presented, contains an abundance of illustrations and tabular data and is copiously indexed.

Shewell-Cooper, W. E.
The complete gardener.
Collins, London 1950 : 21s. : Pp. 734 : 40 figs. : 14 illus. : 125 plates.

The range of information contained in this volume, written by the Principal of the Horticultural and Educational Advisory Bureau, Thaxted, Essex, is to be recommended to those who have used his shorter ABC gardening books. Much of the information, given in simple terms, accompanied by illustrations, arranged in comprehensive sections and well indexed, will be particularly helpful to the beginner.

Apart from detailed sections concerning the choice and cultivation of herbaceous and woody flowering plants, ornamentals of all kinds, fruit and vegetables for different purposes, there are others dealing with growing under glass, practical methods of controlling garden pests and diseases and introductory chapters covering the general considerations of soil management, drainage, tools, methods of cultivation, propagation and planning. Much of the information is of an authoritative nature; this is emphasized, for example, by the pollination charts for tree fruits, reproduced with the permission of the Director of the John Innes Horticultural Institution, and by the *orders for the month* which are written in terse, compelling phrases.

As *The Complete Gardener* appears in response to requests for a single comprehensive volume it is hoped that many gardeners will answer the author's request for comments on his omissions and inclusions.

BIFFEN, R.
The Auricula.
Cambridge University Press 1951 : 15s. : Pp. 164 : 7 figs. : 7 plates.

Sir Rowland Biffen was known to the world as a wheat breeder and as one of the pioneers who demonstrated the applicability of the Mendelian laws to the improvement of agricultural plants. To those who knew him, however, he was much more: he was a creative artist, in the sense not only of being able to paint a picture on canvas, but also of being able to produce one out of living material in the garden. These unique qualities, and the quiet enthusiasm and sense of enjoyment that went with them, echo throughout this book on the auricula. In the preface he frankly numbers himself among "those who have fallen under the spell of this curiously fascinating plant." He devoted some thirty years of patient study to elucidating some of its problems. The results of the study are presented in typically modest form in a slender volume, in which the peculiar characteristics of this unique plant are described in terms sometimes so poetic as to leave no doubt at all where Sir Rowland's partiality really lay. The characteristic meal has, we are told, to an insect walking over it, "a soft, rough surface on which foot-prints show up like those of a rabbit in the snow." When it occurs on the leaves, they sometimes have "an artificial appearance, suggesting that they have been carved out of a block of milk-white jade by a master craftsman." And some of his own plants in the alpine group, "as show flowers they have no merit but they have a gay inconsequence of their own; they are the ragamuffins of the Auricula world."

Biffen's immense knowledge of the auricula was gained from practical experience and an exhaustive study of the early botanical works published in Great Britain and the European continent from the sixteenth century onwards and of the many references in the gardening press. The study has elucidated the origin of the garden auricula, which proves to be one of the most interesting in the plant kingdom. It is, like so many horticultural plants, an interspecific hybrid, between two species, *Primula Auricula* and *P. hirsuta*, differing entirely in type of flower pigmentation, the first hybrid having apparently been grown in the gardens of Vienna in the sixteenth century. The unique edged types prove to owe their origin to a virescent mutation, resulting in the acquisition by the corolla not only of the green pigmentation of the foliage leaves but of the mealiness, which gave the flower much of the diversity which is so notable in the foliage. By combination between the various types, the range of variation within the auriculas is now almost endless and Biffen's own experiments in cross breeding have shown how this range can be still further extended by wide crossing between different species or subspecies. From one such cross the plants resulting are described as "worthy companions to the exquisite 'Linda Pope'." There is therefore every hope that any new breeder, fired with enthusiasm by reading this most engaging book, will succeed in producing further valuable sorts to add to the extensive range of existing sorts, some of which have persisted for a hundred years or more; and, the author remarks in his closing words, "the pleasure they have given to so many, over so long a period, is one of the things in life which is worth working for—if indeed work is the right description of a delightful hobby."

One of the regrettable consequences of the work's having been published in post-war England is that the plates illustrating some of the most interesting auriculas in Biffen's collection are in black and white rather than colour; that it is, for a book of this price, unattractively bound; and that even such an august body as the Cambridge University Press should print casual for causal.

SUMMERHAYES, V. S.
Wild orchids of Britain with a key to the species.
Collins, London 1951 : 21s. : Pp. xvii + 366 : 19 figs. : 43 maps : 72 plates.

The wide appeal of this volume in the New Naturalist series is assured not only by the unique fascination of British orchids but also by the scarcity of comprehensive accounts of this interesting group and the need for a general survey of recent intensive research carried out in Britain. The author, who is in charge of the collection of Orchidaceae at

Kew Herbarium, has the broader knowledge of the family throughout the world as a background for his approach to British representatives. His detailed treatment of species, varieties and hybrids is divided into two sections; the first deals with the family as a whole, including general morphology, life history, pollination, fertilization, geographical and ecological distribution and classification; this is followed by accounts of the groups of allied species and of each species. The whole forms both an introduction to British orchids and a useful reference book containing distribution maps and a key for identification, supplemented by many illustrations which include colour photographs of all but two species. The carefully restrained yet accurate descriptions of the locations of rare individuals are commendable, judging by those known personally to the reviewer.
On the controversial subjects such as mycorhiza and certain aspects of classification a definite statement of "what is felt to be the most satisfactory interpretation" is presented, References to papers published since 1933 are given in the terminal bibliography together with a few of the more important ones from Colonel M. J. Godfery's *Monograph and Iconograph of native British Orchidaceae* published that year.

NEW JOURNALS

Acta Agriculturae Scandinavica.

Acta Agriculturae Scandinavica is published by the Scandinavian Agricultural Research Workers' Association and the Royal Swedish Academy of Agriculture. The journal is a sequel to *Acta Agriculturae Suecana,* which was founded by the Academy in 1945 and ceased publication in 1949. Like its predecessor, the new periodical contains papers on original research in agriculture. The editor is Professor R. Torsell, secretary of the Academy and general secretary of the Scandinavian Agricultural Research Workers' Association. Contributions are written in English, French or German; each volume is issued in three or four numbers. Subscriptions should be sent to the Editor, Post Box 593, Stockholm 1. Price 20 Swedish kronor per volume post free.

Mitteilungen der Höheren Bundeslehr- und Versuchsanstalten für Wein-, Obst- und Gartenbau Wien-Klosterneuburg und für Bienenkunde Wien-Grinzing.

Following the celebration in 1950 of the 90th anniversary of the Higher Federal Institute for Instruction and Research in Viticulture, Fruiticulture and Horticulture, Klosterneuburg, Austria, it was decided to publish the above journal (1) as a link between research and practice, and (2) for the benefit of research workers in Austria and other countries to keep them abreast of results and advances in their various fields. Also associated with the project is the Higher Federal Institute for Instruction and Research in Bee-keeping, Wien-Grinzing, so that Austrian bee-keepers now have a scientific publication at their disposal.
In addition to the paper reviewed in Abst. 1657 the first issue contains articles on: growth hormones in relation to vine grafting (Kraus-Prillinger); Austrian horticulture (K. Hauszer); Fanning by bees (R. Jordan), Cold storage of fruit (J. Falch); Natural science in agricultural schools (G. Kraus); and subsoil irrigation methods (F. Zitta).
Short sections for topical news and abstracts of current literature complete the issue.

The Tohoku Journal of Agricultural Research.

The faculty of Agriculture of Tohoku University, Sendai, Japan, has issued the first number of a journal containing papers on recent agricultural research at the university, written in English. Two articles on genetical studies in the Brassiceae have been summarized in this volume of *Plant Breeding Abstracts* (cf. Absts. 1931 and 1932). Other papers in this number are grouped under the headings of animal husbandry, fisheries and agricultural chemistry.

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Abst. 1117, line 3, *for* Medd. Stat. Trädgårdsförsök 1950 : No. 58 : p. 77. *read* Försök och Forskning 1950 : **7** : p. 77.

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